PROGRESS



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MA PAG

LEBANON, OHIO, Municipal Power Plant habeen using one of the famous *Texaco Ursa Oils* in it two straight diesel engines since 1948 — with excellent results. When two supercharged Worthington dualfuel engines were installed in April, 1951, Texaco was naturally the choice for lubrication.

With Texaco's help, this plant has enjoy•d substantial savings for more than six years. Bearing wear is notably low and ring life exceptional. In fact, recent overhaul showed rings in such fine shape that they could be put right back for re-use. Engines are running clean, lube oil consumption and maintenance expense are minimum.

Benefits like these explain why -

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For over 20 years, more stationary diesel horsepower in the U.S. has been lubricated with Texaco than with any other brand.

You can enjoy similar benefits by lubricating with one of the famous *Texaco Ursa Oil* series—a complete line of lubricating oils especially refined to make diesel, gas and dual-fuel engines deliver *more power*

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TEXACO STAR THEATER
starring JIMMY DURANTE
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with less fuel over longer periods between overhauls.

A Texaco Lubrication Engineer will gladly help you make the proper selection. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

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TWO 8-cylinder, supercharged Worthington dual-fuel engines in Lebanon, Ohio, Municipal Power Plant. Each has 16-in. bore and 20-in. stroke, is rated at 1,760 h.p. at 360 r.p.m. Each drives a 1,245 k.w. generator and is lubricated with Texaco.

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-more work at less cost

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FRONT COVER

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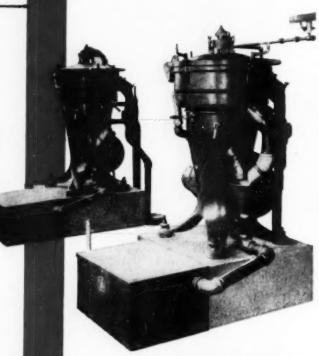
WHY MORE DIESELS ARE RUN ON RESIDUALS PURIFIED BY DE LAVAL

The main reason is cost-cutting...considerable savings in your plant. Because heavy fuels are much cheaper than light distillates...and most diesel engines can be easily converted to burn these residuals, give you a sizeable economy.

De Laval Purifiers take all the problems out of purification — they prepare the fuel properly... remove the maximum of incombustible solids and ash at constant operating speed and efficiency.

If the oil can be pumped, De Laval can purify it! Right now, De Laval Purifiers are handling oils having viscosities between 5000 and 6000 SSU at 100° F— in plants from coast-to-coast. Oils of greater specific gravity than water are also being purified.

Write for all the details...today. Your plant profits can be increased with De Laval Heavy Fuel Purifiers!...



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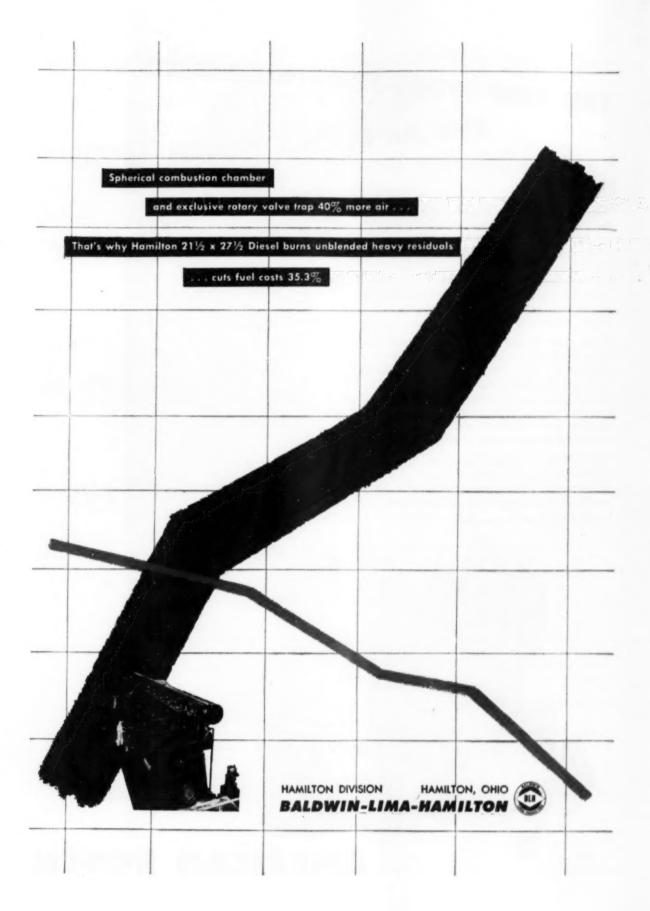
	Unpurified Oil	Purified Oil
Specific gravity at 60°/60° F.	0.968	0.968
Viscosity SSU at 100° F.	5000	5000
Viscosity SSF at 122° F.	225	224
BS&W per cent by volume	0.60	0.20
Water by distillation, per cent by wt.	0.04	Trace
Ash at 550° C., per cent by w	1. 0.045	0.021
Sediment by hot extraction	0.063	0.008



DE LAVAL

heavy oil purifiers

THE DE LAVAL SEPARATOR COMPANY Poughteepire, New York + 427 Randolph St. Chicago 6 + DE LAVAL ACIPIC CO. 61 Beale 51 San Francisco 5



THIS PUMP OPENED NEW DIESEL MARKETS... THE AMERICAN BOSCH "PSB"

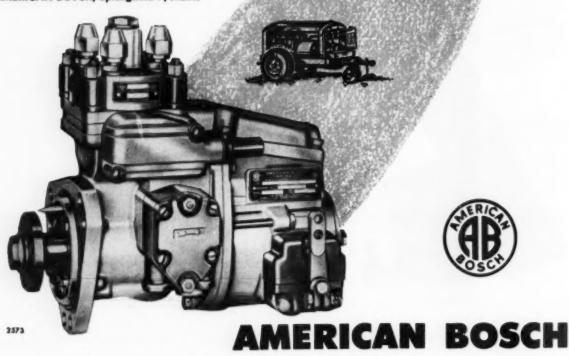
American Bosch's development of the PSB single-plunger pump made it possible for engine manufacturers to produce the smaller, lower-cost Diesels which have opened up new markets for Diesel power. You see it serving everywhere —on efficient Diesels that power farm tractors, compressors, generating sets, boats and trucks in ever-increasing numbers.

Today, more Diesel engine manufacturers are using the American Bosch PSB as standard equipment than ever before. It's easy to see why—for the PSB gives both the engine manufacturer and the user a simplified, compact, lower-cost pump with a proven record of outstanding performance and dependability plus ease of servicing and low maintenance expense.

The PSB is a product of American Bosch's continuing program of research and development. It stands as a significant contribution to the progress of the Diesel.

AMERICAN BOSCH, Springfield 7, Mass.





Random Thoughts from a Filter Engineer



by George Walton

- . FULL FLOW VS. BY-PASS FILTER
- . OCCASIONALLY WE SEND OUT A DEFECTIVE PART!
- . SO MODERN IT STARRED IN A MOVIE!

FULL FLOW VS. BY-PASS FILTER

We've heard a good deal of discussion on the relative merits of full flow vs. by-pass filters and we'd like to add our bit on the subject. Of course, both types of filters have their advantages. The by-pass filter will remove smaller particles of dirt but, as its name implies,

it won't handle all the oil all the time. On the other hand, the full flow filter cleans all the oil all the time. But in order to do this, its media is less dense and so it won't trap the extremely small particles.

We lean toward the full flow type of filter. Most of our oil and fuel filters are full flow. True, the opening size is normally not much smaller than .0013. And often quite a bit larger, because a filter-



FLOW LUBE OIL FILTER

aid bed quickly forms a layer on the filter which provides very much finer filtration than the opening size would indicate.

In fact, many of our customers have found this out and are able to go to a larger size opening with its resulting lower pressure drop and longer service interval and still get the fine particle-size filtration they desire.

Of course, the ideal filter would handle extremely small particles and filter all the oil all the time. But such a filter would be much too large to be practicable. We think we've hit the happy medium in the battle between initial cost and efficiency.

OCCASIONALLY WE SEND OUT A

It's quite a confession for a manufacturer to make, but there it is—we've said it. In spite of checking and rechecking, in spite of inspectors who have been carefully



trained, in spite of constant vigilance all along the line, we, like other manufacturers, occasionally crate up a defective part and send it to a customer.

We're not proud of the fact that we make mistakes.

But we are proud of the fact that we back up every product we make. If our customer isn't completely satisfied, if the part in question is defective in the smallest degree, we take back the part and immediately replace it with a perfect one. And we don't make a great to-do about it, either. There are no questionnaires to fill out, no special conditions to fulfill. We simply take back the part and make it right.

This, of course, is nothing exceptional. Any reliable manufacturer will do the same for his product. The trick is to make sure the company you deal with is reliable—whether you're buying filters or fork trucks.

SO MODERN IT STARRED IN A MOVIE!

We've always thought our plant was pretty special. Recently something happened that helped confirm that belief. The plant starred in a TV movie! A local power company thought so much of our modern, up-to-date lighting system that they chose to use it as a model. So there we were, ultra-modern lighting system and all, big as life on TV!

Actually, there's a moral to this story. The rest of our plant is as modern as our lighting system. We use the most modern equipment, the most efficient methods. We know that men do a better job when their equipment and working conditions are tops. As a result, we think



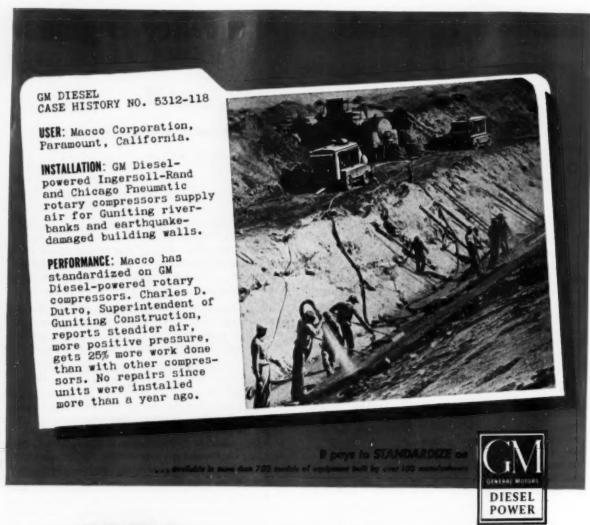
AIR-MAZE PLANT

we have a far better chance of turning out quality products at a competitive price than a company using old-fashioned equipment and methods. We can give you more for your filter dollar.

That Air-Maze does give you more is a matter of record. For 29 years we've made a specialty of giving customers extras in research, service, engineering. And at a reasonable price. The Air-Maze Corporation, 25000 Miles Avenue, Cleveland 28, Ohio.

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"25% more work done" with GM Diesel-powered Rotary Compressors

25% more work done per shift—steadier, more positive pressure—high portability—these are some of the reasons why Macco Corporation has standardized on General Motors Diesel-powered rotary compressors for their Guniting work. They report smoother operation and faster, easier moves.

Quick-acting GM 2-cycle Diesels pack more power in less space, so for building jobs Macco mounts the compressors on light trucks for faster trips. In intermittent compressor operation—and in every other kind of work—precision unit fuel injectors keep fuel consumption down. Contractors tell us that GM Diesels run for years without overhaul, but when parts and service are needed they are always quickly available.

More and more contractors are standardizing on modern rotary compressors designed around quick-accelerating GM 2-cycle Diesel engines. For more details on GM Diesel-powered compressors for your job, call your nearest distributor or write:

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Single Engines 30 to 300 H.P. Multiple Units Up to 803 H.P.

The Engineer's Report

CASE HISTORY

Chevron Starting Fluid

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Fast starts save 50 man-hours each day!



WITH TEMPERATURES DOWN TO 20 BELOW ZERO for weeks, Chevron Starting Fluid speeds up starts of trucks, tractors and shovels at San Francisco Chemical Co.'s phosphate mine at Leefe, Wyoming. Winter temperatures here sometimes drop to 50 below zero, but even then Chevron Starting Fluid makes it possible to start both diesels and gasoline engines. According to Mr. P. S. Pugmire, General Superintendent, this occasionally saves the mine up to 50 man-hours a day—about 2 hours starting time for drivers of trucks and tractors, also time of other workmen who cannot begin work until equipment is operating. Chevron Starting Fluid is available in 1-pint cans and in 7- and 17-cc gelatin capsules. Your supplier also has the new Chevron Pressure Primer System using safe 9.9-cc pressurized steel bulbs which, when punctured, force priming fuel into air intake system, permitting instant ignition.

FREE FOLDERS tell you more about Chevron Starting Fluid and the Chevron Pressure Primer System Write or ask for them today.

FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your distributor, write or call any of the companies listed below.



How CHEVRON Starting Fluid Starts Gasoline and Diesel Engines Instantly



- A. Atomizes in lowest temperatures and provides easily ignited vapor in combustion chamber.
- B. Pressure, or the weakest spark, fires mixture—turns engine and heats air for regular fuel mixture.
- C. Contains lubricant and additives—inhibits cylinder wear and ice formation in primer equipment.

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where trouble-free performance is a must!

At Thule, Greenland, is the site of a U. S. Air Force Base only 900 miles from the North Pole where winter is eight months long and temperatures as low as 50° below zero, with hurricane winds reaching a velocity of up to 150 miles an hour.

Here in this Arctic outpost, 30 Ingersoll-Rand Diesel engines with Bendix* Fuel Injection Equipment generate all the necessary electric power. Obviously it would be difficult to pick a more vigorous proving ground for year-'round efficient performance for these Bendix-equipped Ingersoll-Rand Diesels.

Here is another striking example that when the going is toughest Bendix Fuel Injection Equipment is the logical choice for any diesel manufacturer.



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BENDIX Fuel Injection Equipment



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Export Sales:
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LOCKPORT, N. Y.

NEED A FUEL-SAVING ELECTRIC PLANT?

Then you'll certainly want all of the facts on the diesel engines that have consistently provided dependable power for generator operation at the lowest fuel cost per kilowatt hour!

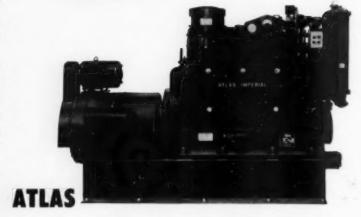
These famous Superior, Atlas and Lister Diesels are widely used for generator power in municipal light plants, water works, sewage plants . . . for standby power in countless industrial operations . . . and for both propulsion and auxiliary power throughout the marine field.

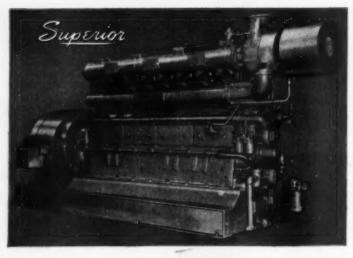
Performance and operating records from hundreds of these installations prove the exceptional economy of National Supply Diesel engines in service. This reputation, plus efficient 4-cycle design and rugged construction, make Superior Atlas or Lister Diesels your best engine investment for power generation.

These National Supply engines are available in a complete range of horsepower ratings to suit virtually every output need (check chart below). For complete information, write or call the nearest sales or service point.

Engine Model	Recommended Generator Capacities		
LISTER FR 1	3— 5 KW		
LISTER FR 2	10—12 KW		
LISTER FR 3	15-18 KW		
LISTER FR 4	20-24 KW		
LISTER FR 6	30—35 KW		
ATLAS Model 35	100 KW to 200 KW		
ATLAS Model 45	100 KW to 400 KW		
SUPERIOR Model 40	155 KW to 500 KW		
SUPERIOR Model 60	280 KW to 645 KW		
SUPERIOR Model 65	420 KW to 1250 KW		
SUPERIOR Model 80	450 KW to 1000 KW		







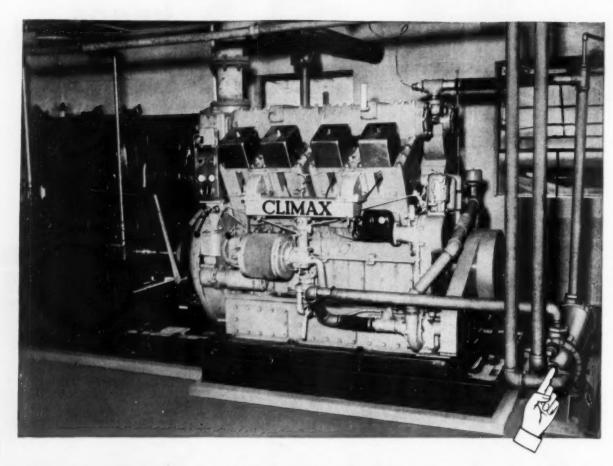


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Ross Exchanger keeps this Climax Engine running cool on 800 ft. water lift

Driving a 700 gpm centrifugal pump at 1200 rpm, this Model V-85 Climax propane burning engine serves an 800 ft. water lift through 8 miles of pipe.

To keep this 8-cylinder engine running cool . . . to prevent overheating . . . a Ross Type BCF Exchanger was furnished. Correct jacket water temperature is thus assured at all times.

"We selected and have continued to use Ross Exchangers because we consider them a quality product and we receive excellent sales service from the Kewanee-Ross organization," says Climax Engine & Pump Mfg. Co.

Rugged, compact and unmatched for thermal efficiency, Ross Exchangers are regularly installed on Diesel, gas and gasoline engines, compressors, speed increasers, reduction gears, and torque converters . . . to cool lube oil, jacket water or hydraulic fluid, as required.

Completely pre-engineered, Ross Type BCF Exchangers are available in a wide range of sizes to fulfill most needs with "off-the-shelf" speed.

For detailed information, request Bulletin 1.1K5.

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GULF DIESELMOTIVE OIL



Over \$460 million has been put into plant improvements since the war to make the progressive Chesapeake and Ohio one of the most modern railroads in America. The modernization program includes a system of centralized traffic control, new mechanical track maintenance equipment, and additional powerful Diesel locomotives.

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Here's wby:

- Effective detergent action prevents harmful piston ring belt deposits.
- 2. Base stocks are selected for their ability to help prevent hard deposits on the piston crown and in the ring belt area.

3. 100% solvent refining (removing undesirable constituents) insures greater stability and better bearing protection.

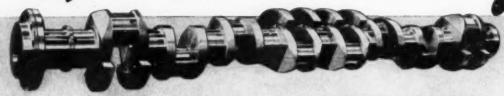
Gulf Sales Engineers, experienced in railroad Diesel operation, are always available to aid you in maintaining high standards of lubrication throughout your system. Write, wire, or phone your nearest Gulf office today for this expert lubrication assistance.

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PRECISELY machined Erie Forge Crankshafts have, for many years, been synonomous with highest quality workmanship. At Erie Forge & Steel Corporation every step in production—from ingot to finished crankshaft, is under one control, one supervision. Every operation falls under closest scrutiny, thus assuring perfection in material specification, forging, machining and finishing. Today's diesels for industry, ships and locomotives depend on Erie Forge Crankshafts. Diesel engines of tomorrow will, too, because Erie Forge & Steel Corporation produces the finest forging you can buy.

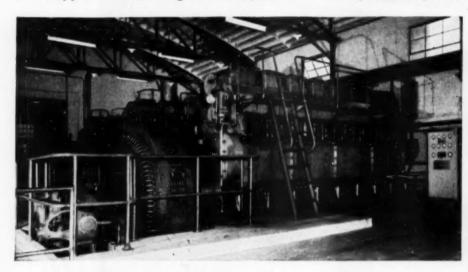


ERIE FORGE & STEEL CORPORATION ERIE, PENNSYLVANIA



Fuel oil savings, 50% longer service ... thanks to Koppers Piston Rings

... Koppers Piston Rings, Municipal Power Plant, Tarboro, N.C.



Here's proof that installation of Koppers Piston Rings can save on fuel, lubricating oil, labor costs.

In conducting routine maintenance operations of the Municipal Power Plant, Tarboro, N. C., it was decided to install a new type of American Hammered Piston Ring.

Tarboro now uses #5 fuel oil (for which diesel was originally designed.)

Result: Tremendous Savings in fuel costs.

In addition, compression has been increased . . . lubrication oil consumption decreased 200%-300%. And thanks to Koppers Piston Rings, cylinder wear has been less than .010 inches after 15 months of operation even under difficult working conditions. Think what that means in longer service, less down-time, lower labor costs.

There are many cases in which the installation of Koppers Piston Rings has proved helpful in getting economical engine performance. Does this suggest savings in operating and replacement costs to you? Then remember Koppers Piston Rings next time you have a diesel overhaul. First thing, investigate Koppers Conformable and Porous Chrome* Rings. And for special assistance with your specific piston ring problems, consult our technical staff.



Koppers Porous Chrome*
Rings. Porous chrome surface holds and distributes oil
during break-in. Seats quickly. This chrome prevents
grit from embedding in ring
surface. Prevents cylinder
wall scratching. Reduces
wear 50%. Last 4 times
longer than other rings.



Koppers Conformable Ring maintains constant unit pressure for positive oil control. Conforms readily to meet cylinder distortion because flexible cast iron member is pressed outward by abutment type spring which exerts uniform radial pressure around entire circumference.

*Van der Horst Process

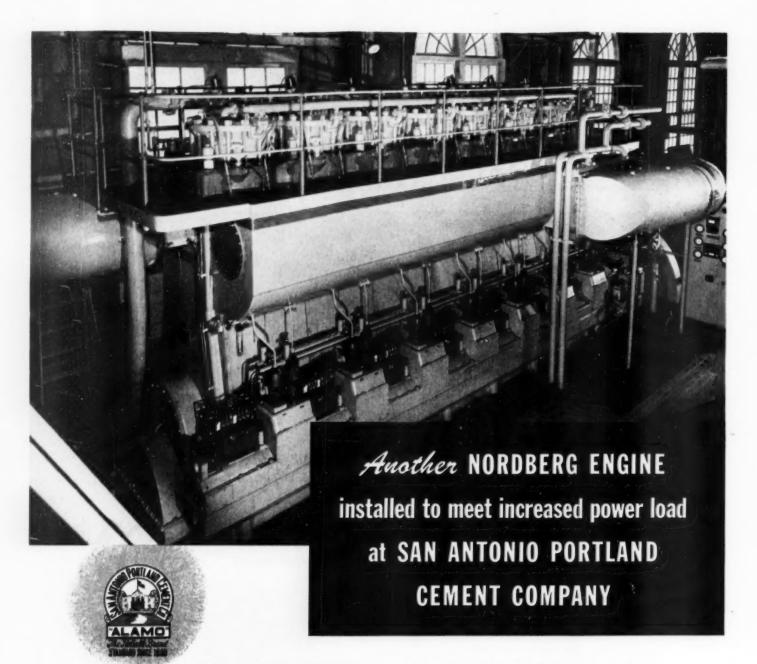
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AMERICAN HAMMERED Industrial Piston Rings

KOPPERS COMPANY, INC., Piston Ring Dept., '582 Hamburg Street, Baltimore 3, Md.
Gentlemen: Please send me full information on your Conformable Oil Ring.

Name
Company

METAL PRODUCTS DIVISION • KOPPERS COMPANY, INC. • Baltimere, Maryland This Koppers Division also supplies industry with Fast's Couplings, Aeromaster Fans, Koppers Bectrostatic Precipitators and Gas Apparetus. Engineered Products Sold with Service



SAN ANTONIO PORTLAND CEMENT COMPANY, one of the pioneer producers in the cement industry, has an enviable reputation for its efficient operation and quality product. Knowing that low cost power means lower cost cement

production, this progressive company has long depended upon Diesel generating units as the main source of processing power for their Cementville, Texas plant.

The first Nordberg engine, a 3600 hp, 2500 kw gas burning unit, was installed in the San Antonio plant in 1948. In 1953, when additional capacity was

required, another large Nordberg gas burning engine was installed—a 3010 hp, 2100 kw unit.

It is interesting to note that while this plant has a total of eight Diesel generating units, the two Nordberg engines represent over half of the total installed horsepower and carry 75% of the total load.

This is one more example of the way Nordberg Engines are being used to provide dependable, low cost industrial power. Next time you have a power problem think of Nordberg... builders of America's largest line of heavy duty engines, from 10 to over 10,000 horsepower.

NORDBERG MFG. CO., Milwaukee, Wisconsin

NORDBERG DIESEL DUAFUEL® AND SPARK-FIRED GAS ENGINES P454

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Pump Equipment & Engineering
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Phone: Monument 6-4444, 5, 6

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DECEMBER 1954



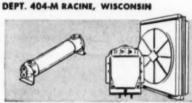
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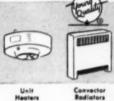
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AFTER 2,000 hours of low-cost strip-mining, veteran mine owner J. C. Kitzmiller reports "smoother stripping — reduced cable cost" due to shock-free power transmission in his Osgood dragline. The savings he's made with his Allison TORQMATIC Converter have made him decide to specify Allison TORQMATIC DRIVES in future equipment.

He's spending less for cable replacement in his Osgood dragline because the TOROMATIC Converter protects cable by absorbing sudden shock loads.

He's spending less for dragline repairs, too. The TORQMATIC Converter gives the operator time to cut off power—"throw out the drag"—when the bucket hits a snag, guards boom and drive line from harmful overloads.

And he's getting more work from his drag because with fewer repairs it stays on the job earning money—out of the shop costing money.

The TOROMATIC Converter matches engine power to load

demand, helps prevent harmful engine lugging and stalling. It multiplies engine torque up to $3\frac{1}{2}$ times—broadens the engine's effective horsepower range.

When load demand is equal to, or less than, engine torque the Allison TORQMATIC Converter acts as a fluid coupling to conserve fuel, boost engine life. This feature is standard equipment in every Allison Converter.

You can produce more for less with shock-free Torqmatic power transmission in your 40- to 400-horsepower gasoline or Diesel equipment. Ask your manufacturer or dealer about Torqmatic Drives in your equipment or write for more information to: Allison Division of General Motors Box 894D, Indianapolis 6, Indiana

ALLISON TOROMATIC CONVERTER

Simple Design - one-piece cast converter elements - minimum maintenance

Compact, easy to install in existing equipment

Designed for power applications in the 40 to 400 horsepower range Longer Equipment Life – absorbs shock, eliminates harmful engine lugging cuts maintenance costs.



1000 KW STANDBY GENERATOR ASSURES AIRPORT ELECTRICITY

CITY supervisors left nothing to chance in building the spacious, new \$14,000,000 terminal at San Francisco International Airport. To assure themselves that floods and other disasters will not disrupt the city's booming air traffic, city officials included in the new facility a fully automatic Enterprise diesel generator set for standby duty. The unit is housed in a specially-built power plant. The Enterprise engine actually is prepared to perform two functions. In case of a power interruption, it will go into operation immediately to provide lighting for landing strips and other oper-

ational essentials. Or, in case of a flood, the diesel will run pumps connected to the field's drainage.

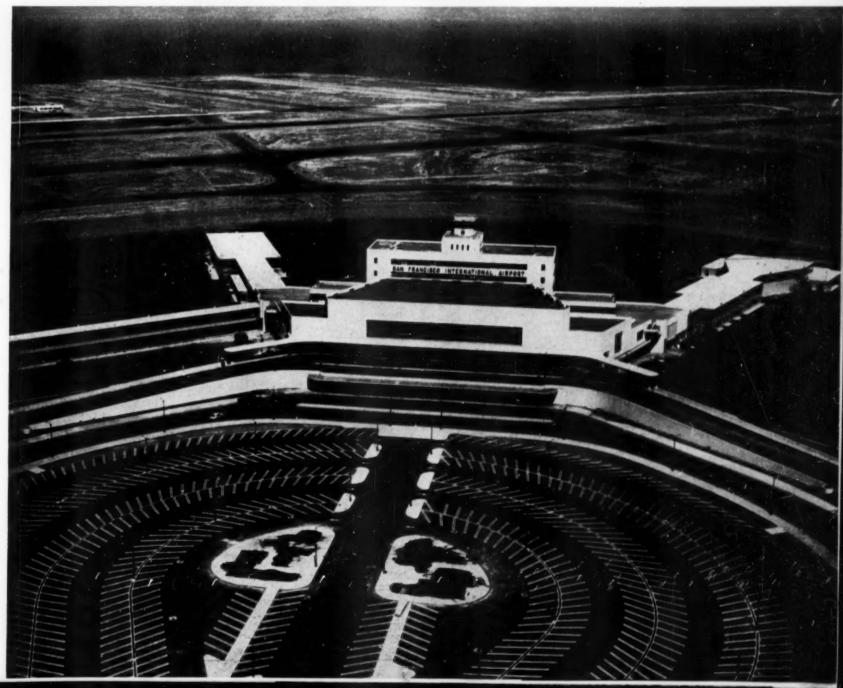
The Model DSG-318 Enterprise diesel is rated 1412 bhp. at 600 rpm. and will produce 1000 kw. Since airports equipped with standby generators normally are in a range of 250 kw., officials of the Enterprise Engine & Machinery Co., believe that San Francisco's 1000 kw. set is the largest devoted to this type of service.

A special feature of the Enterprise standby instal-

lation is the mechanical control device which limits the fuel control shaft position when the engine is first started. This device, developed by Enterprise, limits the fuel control shaft to 15 mm. on the fuel pump racks until the Woodward regulatory governor becomes operative. At that point, this special mechanism disengages and allows the engine to come under control of the Woodward governor.

Specifications met by Enterprise engineers in making this installation were rigid. It was required of them that the set "automatically start and connect

Enterprise-General Electric diesel generator set assures continuous plane operations from San Francisco's new airport terminal. Power plant building is seen, upper left; bay in distance; one of two big parking areas in foreground.



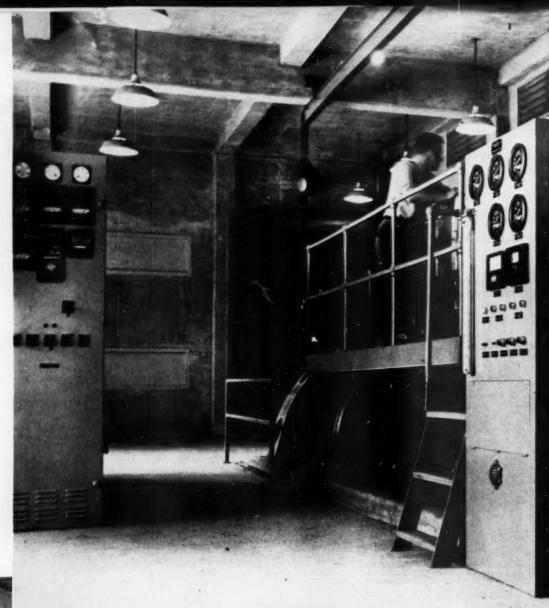
to the station power bus and develop at least one-quarter of rated output at rated frequency within 15 secs, from instant of power failure. Within 15 mins, after starting, the set must assume full load. In the event of complete disruption of the local power source, the power plant must satisfactorily provide continuous full load operation for a period of weeks or months without requiring a shut-down." In all tests prior to acceptance of the installation by city officials, the standby generator assumed one-quarter of its rated output at rated frequency within 13 secs.

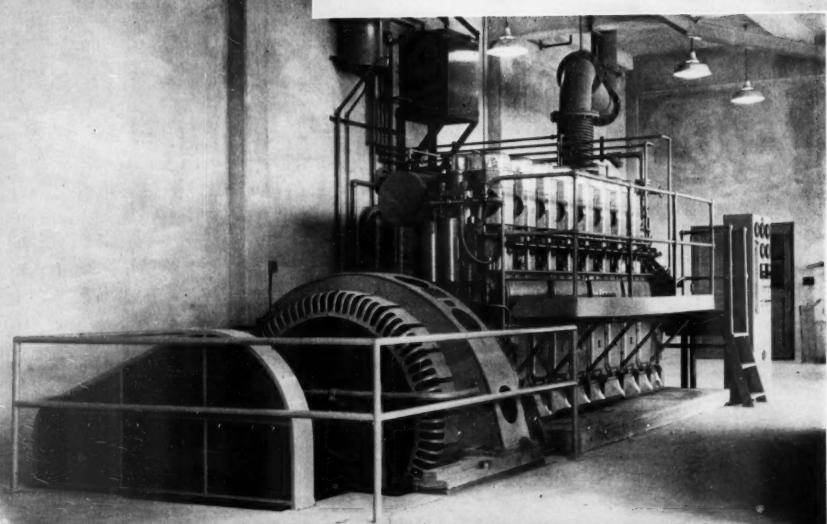
Lighting the modern San Francisco airport terminal is no small job. The sprawling structure contains 317,099 sq. ft. of floor space. The three concourses have an additional 149,534 sq. ft. Twenty-seven aircraft loading positions are served. Eleven airlines currently operate through the airport. Traffic in 1953 included 115,891 planes, in and out—an average of one scheduled landing and departure every 4.5 mins. Last year a total of 1,927,077 passengers arrived or departed. A total of 74,846,880 pounds of air mail, express and freight were loaded and unloaded,

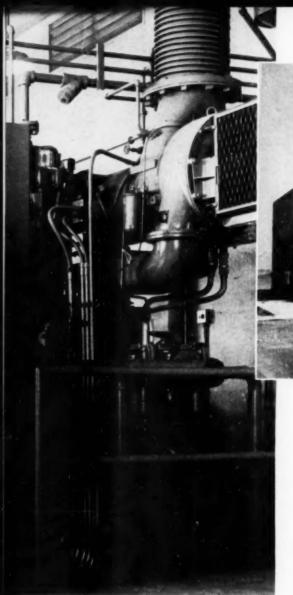
San Franciscans dedicated their new air terminal with an impressive exhibition late last summer.

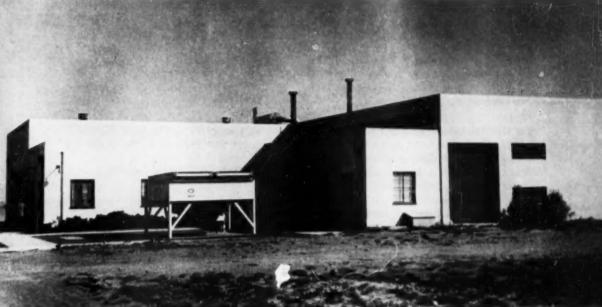
General Electric generator panel, left, and Columbia Electric panel, right, controlling Enterprise diesel, foreground. Elliott turbocharger and Air-Maze air intake filter are seen upper right.

General Electric generator which delivers 1000 kw. for emergency service at San Francisco International Airport. It is powered by an Enterprise DSG-318 engine, rated 1412 bhp. @ 600 rpm.









Power for emergency lighting and drainage pumping is generated in this specificallydesigned building at San Francisco International Airport. Note Marky Dricooler jacket cooling system near building, and Maxim exhaust silencer on roof.

The building, with appendages of ramps, parking areas, and concourses, is located about one mile south of the old terminal that fought a losing battle to keep up with the mushrooming air traffic of the City by the Golden Gate. The new terminal was designed to handle 3,000,000 passengers a year with ease, and it was hoped it could accommodate as many as 5,000,000 before drastic expansion would be necessary. Persons encountering congestion in the restaurant and parking area are inclined to question this.

The International Airport includes a seaplane harbors and contains about 3700 acres, 3000 of which were formerly tidelands. The marshy origin of the airport land caused the city supervisors to provide for emergency drainage when drafting specifications for the standby installation. It also accounts for the unusual construction of the power plant building and the special anchorage given the diesel generator set. Because of the filled land, clusters of piles were driven into the earth. Heavy concrete pile caps were poured on these. And these were integrated with the entire main foundation of the building. The bed for the engine was built as a suspended concrete cradle. The engine was bolted to this, giving a substantial independence against the vibration characteristics of the filled land.

Now said to be worth \$50 million, San Francisco's airport had a plebeian beginning in 1926 when

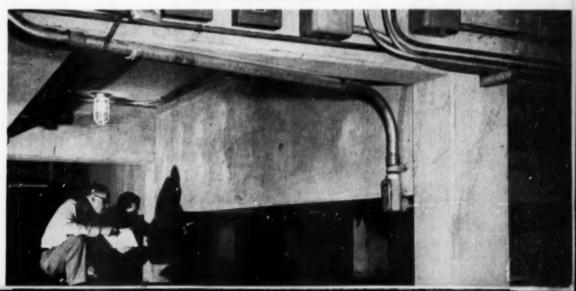
voters approved a \$100,000 appropriation to construct an air strip on land leased from the Darius Ogden Mills estate. The Belair Island site had been reclaimed from the shallow reaches of southern San Francisco Bay by Chinese coolies in the employ of the wealthy banker. As a New York youth of 23, Mills joined the '49ers. But instead of digging for gold, he sold picks and shovels to the miners. Quickly amassing a fortune, he acquired a 4000-acre estate "down the peninsula." On this property, he built his famed 42-room "Happy House."

Wreckers tore down the mansion only last summer when the final 1100 acres of the estate were sold to a sub-dividing firm. A fleet of diesel-powered Wooldridge Terra Cobras moved in and carved home sites from the slopes where the elite once strolled in the shade of imported trees. With dirt obtained on the hillside, the huge dieselized scrapers roared to dump into the marsh adjacent to the great airport. An army of Chinese, using the best shovels young Mills ever sold, could not have moved as much dirt in a whole day as a handful of scraper operators moved in an hour.

List of Equipment

Enterprise DSG-318-1412 bhp. @ 600 rpm., delivering 1000 kw. Bore 12; stroke 15. Turbocharger-Elliott L-404. Generator and exciter-General Electric. Governor-Woodward Model UG-8. Air starting-Enterprise. Fuel oil filters-Purolator, primary; Winslow, final. Fuel oil transfer pump-Roper. Lube oil filter-Winslow, 4-1645 by-pass type, Lube oil cooler-Cooley Thermxchanger. Intake air filter-AirMaze. Exhaust silencer-Maxim 28MU. Exhaust pyrometer-Alnor. Jacket cooling system-Marley Dricooler, closed. Cooling water pumps-Enterprise. Jacket water thermostat-Amot, one 4-in. Lube oil thermostat-Amot, one 2-in. Switchboard and switchgear-Columbia Electric; Generator panel-General Electric. Switchboard instruments-General Electric. Lube oil pressure alarm-Viking. Lube oil temperature alarm-Fenwall. Compressor-Quincy D-3 30-S.

Because airport is on filled-in tidelands, power plant stands on cluster of pilings with heavy concrete caps. Enterprise engine is boited to suspended concrete cradle, overcoming vibration characteristic of the land.



83 TURBOCHARGED DIESELS IN NEW P. I. E. FLEET

By MARK OGDEN

YNAMIC check book action by Pacific Intermountain Express during 1954 gave American trucking and its far-flung allied industries an exemplary stimulant. A. K. Humphries, president, and his colleagues in the gigantic transportation infant, showed confidence in both present and future when they ordered: (a) 103 diesel-powered tractors costing \$1,300,000, and, (b) 476 trailers, costing \$4,000,000 to replace their entire fleet of cross-country van-type units.

Eighty-three of the tractors are built-to-order cabover-engine sleepers, manufactured by International Harvester at the company's heavy-duty truck works in Emeryville, Calif. These Cumminspowered units went into service October 15 on the Denver-Kansas City-St. Louis-Chicago routes of the P. I. E. network. The other 20 tractors, under construction at the Pontiac plant of General Motors Truck and Coach Division, will have hydramatic transmissions.

The most significant feature of P. I. E.'s bold purchases, as far as the diesel engine business is concerned, lies in the confidence manifested in the two most recent developments placed into production by the Cummins Engine Company. After thoroughly road testing the new Cummins turbocharged diesel, P. I. E. specified the Model JT-6 for its 83 International tractors. The new Cummins PT fuel system is used.

The Cummins JT-6 engine produces 165 hp. at 2500 rpm. It weighs only 1540 pounds, giving one hp. for every 9.3 lbs. This compares with 14.5 lbs. per hp. for the other 165 hp. Cummins, the Model HR-6 which weighs 2400 lbs. The dimensions of

the turbocharged Cummins engine are 46x24x40 as compared with 57x30x48 for the Model HR.

Cummins engineers tested turbocharging by entering a car in the 1952 Indianapolis 500-mile race. In his 10-mile qualification run, Freddy Agabashian drove the Cummins diesel race car at a speed of 138.010 miles per hour to win the pole position for the Memorial Day grind. The results of this experiment proved that turbocharging could be practical for truck and bus applications. Agabashian was forced out of the race after 175 miles because the impeller in the turbocharger accumulated rubber particles and other dirt, thus impeding the flow of air for cleaning out gases of combustion. The engine used in the race had the same bore and stroke, had the same displacement, and used most of the same internal parts that now are used in the IT-6 engines.

Following the race, Cummins built two laboratory Model JT-6 engines, one in 1952 and one in 1953, which were operated under typical road conditions by a Columbus, Indiana truck firm. The third laboratory engine built was tested and found satisfactory by P. I. E. Five "pre-production" model engines next were placed in operation by Dan Dugan, a Sioux Falls, South Dakota petroleum hauler. He bought these engines in five International Harvester Model LD-195 trucks. Others of these engines have been sold for installation in trucks and buses, but the P. I. E. order was the first large purchase made.

The Cummins turbocharged engine and the new Cummins PT fuel system both help the trucking industry in its constant battle to reduce the weight of equipment so that larger pay loads can be hauled

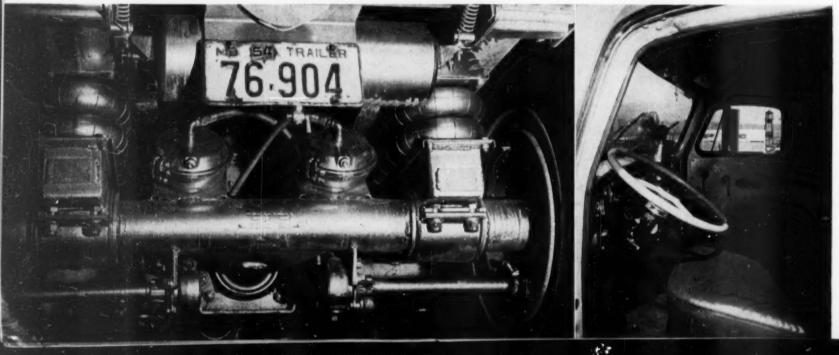
Lined up at P.I.E.'s Denver terminal is a small portion of the fleet of 83 new International tractors powered by 165 hp. turbocharged Cummins diesels.

over the highways within the limitations of various state laws. The new fuel pump weighs only 13 lbs.

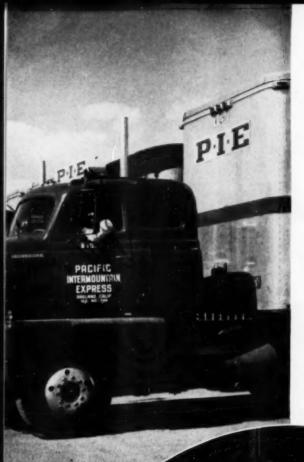
Turbocharging represents the first successful use of engine heat which normally is lost in the exhaust gases. This heat loss represents about 33% of the total heat value of the fuel. The turbocharger utilizes this heat, previously wasted, to drive a gas turbine which in turn drives a centrifugal blower. The latter is connected into the intake manifold so that the engine intake manifold is subject to pressure at all times. Thus, with the

Freight transported in P.I.E.'s 476 new trailers, in effect, will be riding on "life rafts."
Instead of conventional springs, air-filled rubber cushions are used, two on each side, 60 in. long. Automatic valves release air to these "springs" when road shocks are encountered. P.I.E. is the first trucking company to order air springs on an entire fleet of van-type trailers.

While one driver handles "rig," the other sleeps on inner-spring mattress in compartment closed off by curtain. Tractors were designed with safety and driver comfort in mind.



24



larger pressure in the intake manifold, a larger weight of air can be squeezed into the cylinder, and a larger quantity of fuel therefore can be burned. This additional air burns the larger quantity of fuel, increasing horsepower by from 40 to 60% over a conventional engine of equal displacement. High-speed diesels have been supercharged since 1937. However, a mechanical supercharger, being driven by the engine consumes horsepower.

Pacific Intermountain Express started operations in 1941 with net worth of \$226,844, carried 108,251,369 pounds of revenue freight its first year for income of \$1,163,091. After only 13 years, at the end of 1953, the net worth of the company was \$7,464,740. Freight hauls totaled 740,299,970 pounds and gross revenue was \$22,352,491.

Growth continued through 1954, for, in addition to the purchases described above, the company was authorized in mid-year by the Interstate Commerce Commission to take over full control of six companies: West Coast Fast Freight, System Truck Service, System Parts and Equipment Co., Produce Distributing Co., and Eckart Forwarding and Distributing Co., all of Seattle, and System Tank Line, Portland. Among other things, these consolidations

gave P. I. E. a north-south franchise on the west coast and put the company into the petroleum transportation business.

The fleet purchase from International Harvester followed a year's pilot operation on P. I. E. routes. Executives, engineers, and maintenance men from the transportation company worked closely with International Harvester engineers in determining specifications to fit the tractors precisely to the requirements of their service. P.I.E. men also worked closely with the trailer manufacturers. Mr. Humphries has expressed the belief that P.I.E. equipment now is the most modern in the world. The company made its first major move into the perishable hauling field by specifying that 106 of its new trailers should be mechanically refrigerated.

International made a contribution to the weightreduction battle by extensive utilization of high tensile steel and aluminum alloys throughout the truck chassis. The Fuller Roadranger transmission which gives a driver control over 10 speeds through one lever is used in the 83 International Harvester tractors. Other features include hypoid rear axles, nylon transport tires of a new small 10.3 dimension, forged aluminum wheels, aluminum fenders and aluminum front spring brackets, front shock absorbers, front tow hooks, 100-amp, alternator, air brakes with 12 cu. ft. air compressor and special rear springs. Cab features include white plastic steering wheel, airfoam seats, and the large capacity heater mounted under the sleeper deck. All of the trailers ride on air springs.

List of Equipment

Model DC 504 L International sleeper-cab tractors with 152 in. wheel base.

Model JT-600 Cummins Diesels, turbocharged, with new Cummins PT fuel pump. 165 hp. @ 2500 rpm.

Schwitzer-Cummins Turbochargers.

Model R 95 C Fuller 10-speed Roadranger transmissions.

Model Q 100 Timken rear axles; ratio 5.28:1.

Model FE 900 Timken front axles with nylon bushings,

Westinghouse Air Brake system.

Bendix-Westinghouse hand brakes on rear axles.

Tires-Firestone, Gates, General and Goodyear-10.3, high pressure.

Alcoa aluminum wheels.

Delco-Remy 12-volt starters.

Autolite 6-volt batteries, two per tractor.

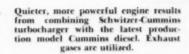
Ross steering.

Young radiators.

Aeroquip hose lines.

Leece-Neville 100 amp. alternators.

Fram lube oil filters.



Cummins engineers satisfied themselves that a turbocharged automotive diesel was practical by building this "mount" for Freddie Agabashian to drive in 1952 Indianapolis "500."

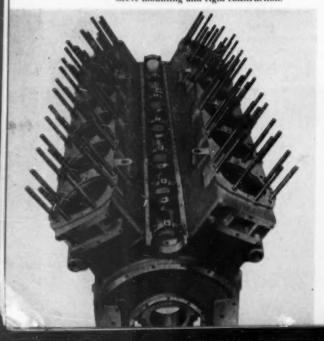




The Waukesha Model VLROBU 12-cylinder, 8½-in. bore and stroke, 5788 cu. in. complete power unit, for operation on natural gas or butane-propane. The unit is designed for rugged oil field use.

AUKESHA Motor Co. makes its entry into the oil-drilling market with the announcement that it has in production a new dual-fuel engine. Waukesha's latest power pack-

Cylinder block-crankcase showing camshaft bearing seats and caps, holddown studs, top deck for cylinder sleeve mounting and rigid construction.

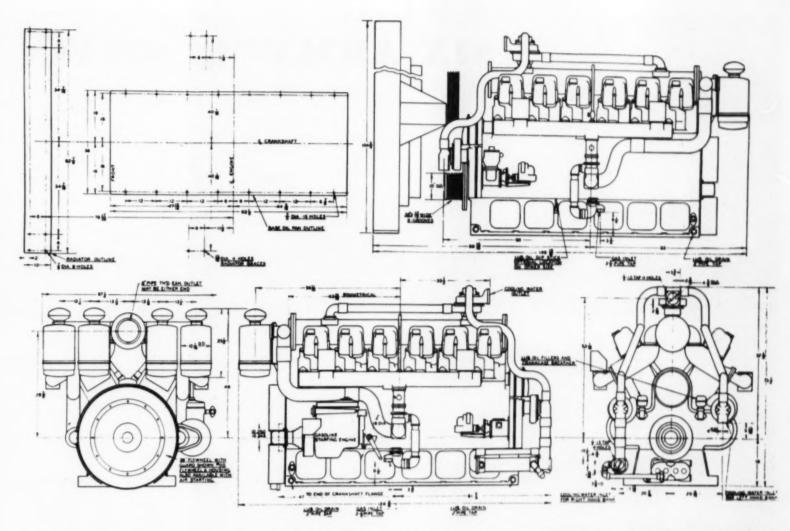


age was designed specifically to meet the demand for deeper drilling, faster penetration, and greater rig portability. The new Model VLR series Waukesha is a high compression, 12-cylinder, 4-cycle type. It has $8\frac{1}{2}$ -in, bore and stroke, and 5788 cu. in, displacement. It is built with overhead valves and a 60° vee. As a full diesel, it is offered with normal aspiration or turbocharging. Parts and accessory kits can be purchased for conversion to propane-butane or natural gas fuel.

Operating on butane-propane, the engine develops approximately 870 hp. with radiator, fan, and air cleaners. Unit ratings of the normal diesel and the turbocharged diesel are approximately 800 and 1100 hp., respectively. Bare engine ratings are higher. Operating speed of the engine ranges from 600 to 1200 rpm. Maximum rpm, and hp. ratings for natural gas and butane-propane operation, and for diesel operation with and without turbocharging are listed in the accompanying table. Turbo-supercharging of the diesel unit affords a great increase in horsepower with a minimum of parasite load. The twin turbochargers, operating from the exhaust in the

"V" of the engine, increase output through a range of from 25 to 35%, varying with service speeds and accessory requirements. This is accomplished without intercooling. Because there is no mechanical drive from the engine, the parasitic load of the turbochargers decreases at part engine load, improving overall fuel economy throughout the speed range.

This new high horsepower engine reduces considerably, and in some instances may eliminate entirely, the need for engine compounding. Initial cost of the unit is less than the cost of two engines, each with half the horsepower, and the weight is less; transportation, moving, and installation are cheaper, easier and faster. Weight reduction-a consideration of importance in offshore drilling and marine installations-is achieved by the use of aluminum wherever operating requirements permit-in the pistons, gear housing and cover, intake manifold, rocker arm covers, and oil pan doors. Other applications visualized by the manufacturer for the new V-12 engine include feeder pipe lines, heavy compressor operation, municipal power plants, central generating plants,



various offshore and workboat operations; in logging, quarrying, mining, shipping, construction; and wherever there is the need for continuous, heavy-duty operation requiring up to 1000 hp.

VLR series units for operation on gas fuel are equipped with twin carburetors, one on each side of the engine. The two carburetor throttle shafts are coupled to the end of a single cross shaft extending through the crankcase center main bearing support web and are operated as one. By means of this synchronized control, both cylinder banks produce equal horsepower with the carburetors in suitable adjustment, and the arrangement lends itself to remote operating control. The built-in Waukesha governor is a centrifugal close-regulating type. Governor-carburetor linkage is straight and simple without appreciable play or looseness, and provides quick engine response to the governing action. Hydraulic governors may be specified on either gas or diesel units without making any special mounting arrangements.

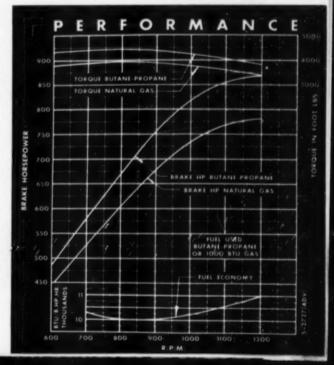
Both gas and diesel versions are equipped with a 30 hp. Waukesha gasoline starting engine, mounted on either side, and a heating tube in the base oil pan for preheating of the lubricating oil supply with steam, hot water, flame, or starting engine exhaust. Starting engine exhaust is used to heat the intake manifold on diesel operation. For easier, quicker cold weather starting, the diesel heads have compression releases for releasing one bank of cylinders and starting on the other. Air starters may also be used.

Normally the engine is equipped with a 39 in. or SAE 00 open flywheel, and is well suited to fluid coupling and torque converter applications. Fixed stub shaft for direct coupling drive, or heavy-duty power takeoff and clutch (with or without shaft extension and outboard bearing) may be specified as original equipment. Twelve individual cylinder heads constitute one of the design features of the new unit. Each head can be removed easily by two men, with no interference from other parts and accessories, Individual removal makes for easy repair and maintenance of the entire upper valve mechanism carried in the heads, removal or replacement of cylinder liners, and easy changeover from diesel to gas and back to diesel. Interchangeable, high-capacity, gear-driven coolant pumps are ball-bearing type, self-lubricated for life. Each pump supplies its own cylinder bank, but both have a common discharge reservoir in the top of the radiator assembly. Carbon-type rotary pump seals can be changed without removal of the pumps from the engine.

The diesel models of the new V-12 series can be converted easily to gas operation. In the conversion kit available, principal parts, assemblies, and accessories are grouped in ignition, carburetion, governor, and cylinder head systems. Heads are factory-assembled and delivered with valves, springs, insert, and guides in place. New gaskets, fasteners, and standard hardware parts are also provided. Factory engineers say any competent oil field mechanic can make the conversion in the field without special tools.

Maximum Speed & Hp. Ratings—VLR Series Engines & Complete Power Units

		Max.	Max.
	Model	Hp.	Rpm.
Natural Gas			
Bare Engine	VLROB	810	1200
Complete Unit	VLROBU	780	1200
Butane - Propanc			
Bare Engine	VLROB	900	1200
Complete Unit	VLROBU	867	1200
Normal Diesel			
Bare Engine	VLRDB	830	1200
Complete Unit	VLRDBU	797	1200
Turbocharged Die	sel		
Bare Engine	VLRDBS	1135	1200
Complete Unit	VLRDBSU	1091	1200

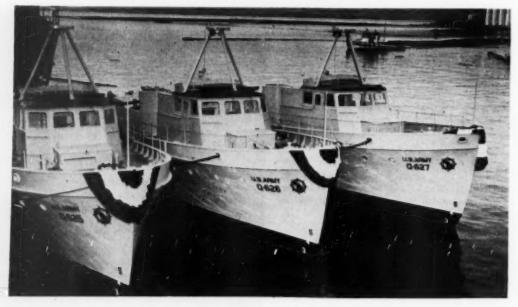


SIX ARMY "Q" BOATS

IRST order of specialized wood diesel boats for the Army Transportation Corps, produced under the supervision of the Navy Bureau of Ships incident to the unification of the armed forces, is the neat little group of six almost identical Army patrol boats, of the "Q" class, completed in two batches of three by Tacoma Boatbuilding Co., Tacoma, Wash. The

first three were completed and rested at the dock pending a decision by the Army as to whether to mothball them against emergency needs. The second group of three were left on the ways, two on one covered way and the third in a nearby area, and launched recently almost 100% complete. Full delivery of all six was accomplished this summer.

Three of the new Army "Q" boats are shown tied up shortly after launching ceremony.



Of slim, easy lines and of almost yacht-like appearance below, with minimum of deck obstruction, these little harbor patrol ships have plenty of maneuverability and are easy to maintain and operate. Principal dimensions are:

Length, over-all—64 ft., 11 in.
Beam, over-all—16 ft., 5½ in.
Draft, maximum—4 ft., 4 in.
Speed, maximum—14 knots
Tank capacities—1200 gal. fuel, 400 gal.
fresh water.

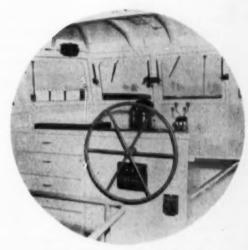
They are built to the best yacht specifications with bent oak framing, mahogany planking, fir decking and deckhouse and interior work generally of thick waterproof Douglas fir plywood sections. Because of their use, standard equipment was specified, a general relief in this yard from the complicated non-magnetic equipment specified for the past three years in the extensive Navy ship program. So they rolled through the production lines fast and inexpensively! General layout below starts off with toilet and shower facilities in the forepeak; crew's quarters next aft for four; galley and officers' quarters next; engine room with two fuel tanks amidships; cargo space and quarters for four more crew and a regulation cockpit with floor at about waterline level aft.

Mechanically the patrol boats feature a pair of 205-hp. General Motors Detroit Diesel 6-cyl-

by C.F.A. Mann

inder, 2-cycle engines developing their rated output at 1600 rpm. Bore and stroke is 5 by 5.6 in. with 660 cu. in. total displacement. They are fresh water cooled, have 25-volt Delco-Remy starting and drive twin Coolidge 34 by 25 in. propellers, through Allison reduction gear drive, with 2:1 ratio. The steel rudders were fabricated by Birchfield Boiler Co., Tacoma. Starting battery generator is a Delco-Remy 500-watt unit on each main engine. Ross heat exchangers and Maxim mufflers are fitted to each main engine, and Willard batteries are used for starting and a 14-cell Gould battery set for ship's use when the power plant is shut down. Governor on the main engine is by King-Seeley and A. C. lube oil filters.

A 2-cylinder Sheppard diesel is fitted driving a Star-Kimble 5 kw., 120-volt dc. generator for ship's lighting and main battery charging. An Autolite starting motor is also fitted (24 volts). An Oberdorfer fire and bilge pump, driven through a Twin Disc clutch unit; a Jabasco salt water pump; A. C. fuel oil pump; and a Universal fresh water (potable) pump complete the general pump layout. Gross cooling water strainers are fitted on both main and auxiliary diesels. A 2 kw. Kato M. G. set is



Wheelhouse, showing Naud-designed controls, made by Mathers Supply.

fitted. Also fitted are a Wilfred O. White compass; Kilborn Sauer searchlight; Way Wolff oil fired heating boiler; Sutton ventilating fans and full CO₂ firefighting system; Ets Hokin and Galvan main switchboard and navigation panel, with installation by the yard. Syntron shaft seals and Goodrich cutless stern bearings are fitted. Propeller shafting was manufactured by Tacoma Boatbuilding Co., Inc.

Engine room, showing the main engines— Chil diesels. They use Gross cooling water strainers, King-Seeleg germans, Parolator filters, Delice Runy stater and generator and Willard batteries. A 2-cylinder sheeppard diesel drives a Star-kimble 5 km, generator.

OLESSEL DELICED DIESEL POWER

F a war of jet planes and electronic devices is lorced upon the United States, diesel engines are prepared to serve again in a new role. This military part for diesel was written into the script by the U. S. Air Force in order to meet the stringent ground power requirements of the Boeing B-47 Stratojets. And this is the story of how three manufacturers teamed up to provide ground support, based on diesel, for the big bombers.

The Air Force's jet bombers today are so powerful that they approach the speed of sound, already exceeded by fighter planes. As our jet planes grow larger and faster, there also is greater need for more power to start their engines. The need intensifies, too, for portable power to support the electronic equipment so vital to the successful military functioning of the aircraft. Not only is a larger quantity of power needed, but the quality must be more precise, both under transient conditions and under steady state conditions.

Successful bidder for a contract to manufacturmore than 150 ground support systems for the B-47 bombers, the Marathon Electric Manufacturing Corp, enlisted the aid of Electric Service Engineering Co., and of Caterpillar Tractor Co. The control equipment and switchgear supplied were designed and manufactured by Electric Service Engineering Co. Readers will observe that each of the manufacturing firms is a specialist in its field.

Team-work by specialists is precisely what it takes to develop and produce all of the increasingly intricate equipment required to keep the armed forces of the United States on an equal footing with potential enemies. This example, rather than being unique, is fairly typical of the cooperation within industry.

Four of the gigantic B-47 bombers require a complete portable support system of 10 separate units in order to assure independent combat readiness. As can be seen from the photograph to the right, a support system in transit somewhat resembles a miniature train. Besides the diesel-generator set on wheels, there are eight trailers, plus a cart with a 4-circuit cabinet. The system, or train, can be moved about with a truck, tractor, or any one of the numerous other vehicles commonly used by the military. Broken down into like units, a single ground support system consists of:

- A trailer-mounted diesel-electric set, rated at 150 kw., 60-cycle, and complete with all necessary components to make it a self-contained unit.
- A distribution cabinet which in effect is a trailer-mounted distribution system; it takes the output either from the diesel generator, or from a commercial source and distributes it to four circuits.
- Four trailers, each carrying rectifiers with control equipment to furnish direct current for starting the jet engines.
- Four trailers, each carrying a motor-generator set, consisting of a 60-cycle synchronous drive motor, and two 400-cycle generators which supply power to maintain, service and calibrate the equipment in the aircraft.
- Cable assemblies to make the interconnections between ground support and aircraft.

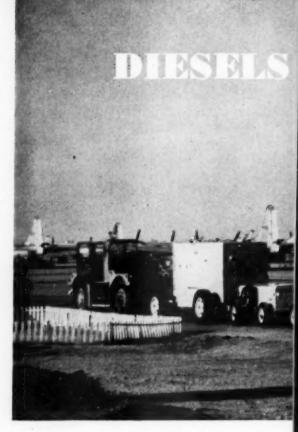
The diesel-electric set consists of a D364, 5-3/4-in. bore, 8-in. stroke, 8-cylinder, V-type, diesel engine, operating at 1200 rpm., driving a single-bearing Marathon 254/440 volt, 3-phase, 60-cycle, 0.8P.F.

150 kw. generator. The complete unit, including radiator, fuel tank and switchgear, is mounted in a weatherproof enclosure on a trailer. Vernatherm radiator controls are used. The trailer incorporates provisions for winterizing the diesel-electric set to minus 65°F.

The diesel-electric set has several features which make it especially well suited to this type of service:

 The injection system designed and built by Caterpillar and incorporating precombustion chambers and single-orifice injection valve, permits the engine to run at light load, such as the 400-cycle maintenance load, and then instantaneously pick

> A close-up view of the Eseco switchboard before installation. This panel contains in one compact, rugged package all the components necessary to provide rapid and precise regulation of the multi-purpose support system.





age all the tomponents increasary to provide rapid and precise regulation of the multi-purpose support system.

DIESEL PROGRESS



View of the complete "Ground Support System" showing the big trailer-mounted Cat D364 electric generating set, the eight trailers and the four-circuit cabinet which make up the entire unit. Marathon Electric built 150 of these.

up full load, such as is required to start jet engines.

2. The diesel engines have the ability to burn undiluted JP-4 without any engine adjustments.

3. The D364 was designed for easy maintenance. As an example, all pistons and main or connecting rod bearings can be changed through inspection doors. Also an injection valve can be changed in three minutes. All injection valves or pumps are interchangeable without balancing.

The guiding specification used in the design of the diesel-electric set was MIL-G-10327. Several

> A familiar scene where USAF B-47 Stratojets are based. The trailermounted diesel at right powers the ground support system for the jet bombers.



deviations from the specifications, such as the operating voltage and deletion of 50-cycle operation, were requested by the Air Force.

The four-circuit distribution cabinet contains necessary circuit breakers for control and distribution of the power from the diesel-electric set to the recifier units and motor generator sets. This includes the power circuit breakers, control relays, weather-proof plugs for cable connection, control power transformers and main bus. The power circuit breakers are motor operated and have a continuous rating of 150 amps. and an interrupting capacity in excess of 25,000 amp. RMS value. In addition, a manually operated circuit breaker and a transfer switch are provided to permit the system to be fed from station power.

The rectifier trailer, complete with its own control system, consists of the necessary rectifier stacks, controls, instruments, switches, relays, contactors, protective devices, receptacles and power output cables to provide the necessary dc. power in accordance with specifications. The input can be derived from the diesel generator set or from an available power source. The two rectifier sections, each rated 750 amps. at 28.5 volts, are complete with magnetic amplifier-type voltage and current limit regulators and filters. The ripple voltage is within the specifications of 1% peak to peak.

The magnetic amplifier regulates the voltage within plus or minus 1½ volts for all values of load up to and including 1000 amps. per section; the regulator limits the output to a maximum steady state value of between 1000 and 1100 amps. per section. An extremely difficult feature required by the specifications covering this system is that the output voltage during changes from no load to full load must recover and remain within the rated value within a period of 0.2 seconds.

The motor-generator trailers contain a 60-cycle synchronous drive motor with exciter and two 400-cycle generators together with controls, instruments, switches, relays, contactors, protection devices, and magnetic amplifier voltage regulators.

The input power to the synchronous motor is 400 volts at 60-cycles. The motor has a power factor of 80% and is of the synchronous type in order to maintain constant frequency of the 400-cycle generator output.

The generators are mounted in one frame with two separate outputs. One generator has an output of 20 kva., 115 volts at 0.9 power factor, 400 cycles, single phase, while the other one has an output of 3.75 kva., 115 volts at 0.8 power factor, 400 cycles, three phase.

The total harmonic content in the wave form of the high-cycle generators is such that the arithmetic sum of the amplitudes of all the harmonics does not exceed 2% of the amplitude of the fundamental at any load. The excitation of the synchronous generators is provided by magnetic amplifiers. These magnetic amplifiers also aid in meeting the requirement that the output voltage, during changes from no load to full load, shall recover to and remain within 1% of the rated value in .15 seconds.

Actually the total inherent harmonic content of the generators is well below 1% RMS value. This is necessary because the magnetic amplifiers introduce a certain amount of harmonics into the generators. The output voltage modulation of the 400-cycle generators does not exceed 1% from no load to full load. A constant voltage within plus or minus 1% of the adjusted no load voltage is supplied over the entire required range. Rheostats allow manual setting of the no-load regulated output voltage.

VENEZUELA: BOOMLAND DIESELIZED

By JAMES JOSEPH

Cut and filled along 10½ mountainous miles, shaping the Autopista, world's most expensive super highway. The 4-lane engineering feat links Venezuela's capital city, Caracas, with both its chief seaport, LaGuaira, and its largest airfield, Maiquetia (pronounced "my-ka-teea"). On the job were more than 200 bulldozers, tractors and kindred equipment building the highway which cost \$6,300,000 a mile. Thus does the Venezuelan government plow back into public works much of the nearly \$500 million it annually receives from oil.

A 120-car ore train rolls down the 3% grade off Cerro Bolivar, the fabulous iron-capped mountain which U. S. Steel is developing in the state of Bolivar. Braking the 10,000-ton cargo is a 185-ton, 1600 hp. Baldwin-Lima-Hamilton diesel electric locomotive. All told, nine dieselized engines ply 91 miles of trackage from the mountain to U. S. Steel's Puerto Ordaz, on the mighty Rio Orinoco. Upstream, at Ciudad Bolivar, Nordberg is installing two 1600 kw. engines, reinforcing the city's electric plant.

Most of Venezuela's up-and-coming merchant marine (97 ships aggregating 166,562 tons) is dieselized. That includes Compania Anonima

Front of power house in city of Caracas.

Nordberg diesel engines installed in Caracas power plant. Venezolana de Navegacion's 10 vessels, 6 of them coastal steamers driven by 900 hp. Nordbergs. Another seven ships will likely be transferred to the fleet as Venezuela's bottoms share in the recently disbanded Flota Mercante Grancolombiana, a former joint venture with Colombia and Ecuador. Grancolombiana ran a total of 32 vessels, 17 of them chartered. Newest addition is the 5900-ton S.S. Ciudad de Cumana, recently launched by Montreal's Canadian Vickers, Ltd., and powered by a 4275 hp. Nordberg. This ship will now go to Compania Anonima Venezolana de Navegacion.

Between Caracas and oil-rich Lake Maracaibo lies Barquisimeto (pop.: 116,000) whose power is diesel-generated by Energia Electrica de Venezuela. The plant includes five 1600 to 2500 kw. Nordbergs, a number of Worthington engines as well as some smaller German units. Of the 60-odd most important power plants in Venezuela, 26 are dieselized with an additional 14 now under construction. By sometime next year, likely 67% of the nation's power installations will be diesel. The country's preference for dieselization is obvious and founded on near-athand fuel. As the world's No. 2 producer of oil (1,734,359 bbls./day during 1953), Venezuela's biggest domestic bargain is fuel (gasoline: 11 cents a gallon; diesel fuel, from 11 to 15 cents). During 1952, some 20,575,684 barrels of diesel oil were produced in the country's 12 refineries. Dieselized Venezuela alone consumed 510,044 short tons. All this adds up to a boom-and a dieselized one at that.

Actually the boom has been of fairly long duration, commencing with oil activities in the '20s. And it has been continuous, thanks to private capital and the government's penchant for plowing fully 30% of its total budget back into public works. The republic's 1953-54 national budget, a cool \$741,000,000, allots some \$213,000,000 for public works. Sounds fantastic? It is. For

no nation, in proportion to size, is investing more in civic improvements and substantial, calculated ones at that. Add to this a \$2.3 billion foreign investment (1952) and it all adds up to prosperity and high prices. Venezuela has both. Long after midnight crews are still at work on hundreds of Caracas building projects. "They tear up streets so fast here, and rebuild them, that I'm never surprised to find a boulevard where only last month was a narrow street," says a long-time American resident. And Venezuelans have money to spend, lots of it. A good share goes into mechanization — automobiles (mostly U.S.), home appliances, industry (including heavy construction equipment).

Whereas in some Latin countries you can travel many miles without seeing a piece of modern diesel road-building equipment, Venezuela is, according to one dealer, "lousy with roadgraders, bulldozers, tractors." You begin to realize just how "lousy" when you see the figures from International General Electric. As of November, 1953, GE had sold approximately 7000 units of Caterpillar. Included were tractors and electric plants, but little agricultural equipment and only a few units used in the oil fields. More precisely, then, the figure represents heavy road, construction and industrial equipment sold or processed through the Caterpillar franchise. There were: 2500 track-type tractors; 58 wheel type (DW 10s and DW 20s); 1770 stationary engines; 600 motor graders; 137 earth-moving scrapers; 700 bulldozers. And lots more.

Diesel equipment is also hard at work in Venezuela's fields, although agriculture is not yet well developed. To encourage immigration of skilled European farmers, Venezuela has set up the National Agrarian Institute. During the past five years the Institute sponsored 20,000 immigrants, most of them from Italy, Spain, Western Germany and the Canary Islands.



Diesel equipment at work during building of the Autopista, world's most expensive super highway.

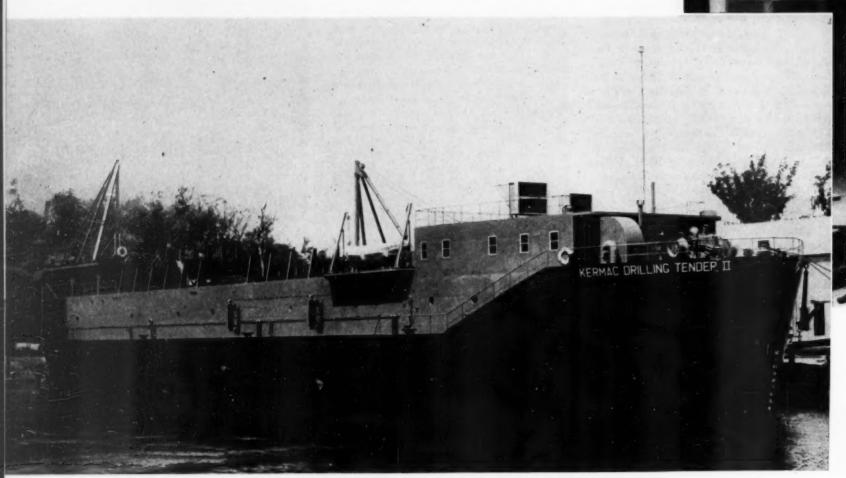
"M. N. Zulia," one of six coasters for Compania Anonima Venezolana de Navegacion, built by Canadian Vickers, Ltd. Each is powered by a Nordberg 4-cycle, 6-cylinder, 13-in., 900 hp., 450 rpm. marine diesel engine.



DRILLING TENDER "KERMAC II"

Ten Diesel Engines Supply Power for Variety of Functions; Hull Design Provides Safety and Comfort During High Winds, Permitting Stern to Lay-to the Weather

By JAMES W. CALVERT



Drilling tender Kermac II, newest vessel to join offshore drilling fleet of Kerr-McGee Oil Industries in Gulf of Mexico. The 250-ft. vessel was built at Madisonville, La., shipyard of Equitable Equipment Co.

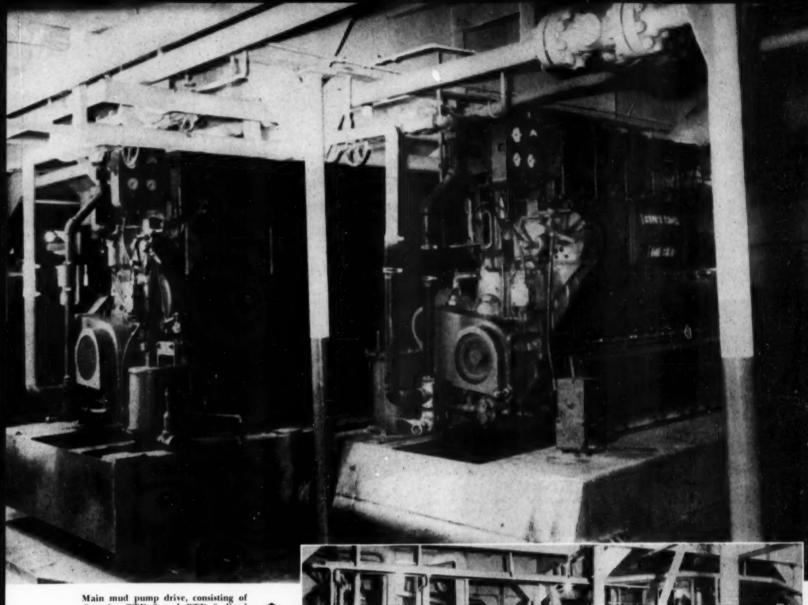
SELF-CONTAINED powerhouse, machine shop, warehouse and floating hotel to meet the rugged demands of offshore oil exploration and drilling in the Gulf of Mexico is found in Kerr-McGee Oil Industries' newest drilling barge, the Kermac II, recently commissioned at Equitable Equipment Co's. shipyard at Madisonville, La.

The new tender is regarded as the marine designer's best answer to the gigantic engineering problem of offshore drilling for gas and oil. Built in accordance with standards of the American Bureau of Ships and the U. S. Coast Guard, it is outfitted similarily to the six YF barges converted by Equitable into drilling tenders. But the Kermac II has greater draft and such "built-in" features as special tanks for mud, Halliburton cementing units, airconditioned quarters for the crew, an elevated work platform on the stern with necessary hoists and rigging, and a sea-wall to afford maximum protection against heavy weather.

The all-steel drilling tender is 250 ft. overall, with a 50 ft. beam and depth of 15 ft. 8 in. In the hull are tanks of potable water (forward) and drilling water (amidships and aft) and a lower engine room which contains generators, mud transfer pumps, two bilge pumps, fuel oil transfer pumps, and fans. The main deck has air-conditioned quarters for 40 men forward with pits amidships

for stowage of drilling mud. There are two engine rooms on the main deck, one for powering the Halliburton skid unit and the second for main mud pumps and drives.

On the upper deck are five racks for pipe stowage, two 5-ton derricks for material handling and additional living quarters and recreational rooms. The hull is designed to permit the stern to lay to the weather as an additional safety precaution. The barge is anchored stern-to the prevailing winds and seas and held fast by seven anchors. In case of a storm, the tender simply would be cut loose from her moorings and would drift away from the drilling rig, the hull design preventing the vessel



Main mud pump drive, consisting of Superior PTD 8 and PTD 6 diesel engines.

from broaching, as it might in the case of a convential YF-converted drilling tender.

A total of 10 diesel engines supply power for the various functions of the drilling tender. Two Superior model 40 PDT 6 and 8 engines drive the main mud pumps, circulating mud to the drilling rig. There are two GM 671 engines on the Mission mud transfer pumps, transferring drilling mud from stowage tanks to the drilling mud pit. Three GM series 6-110 engines power the three 100 kw. generator sets which provide the main power supply, and three GM 6-71 engines power the Halliburton dual 7-10 cementing skid units.

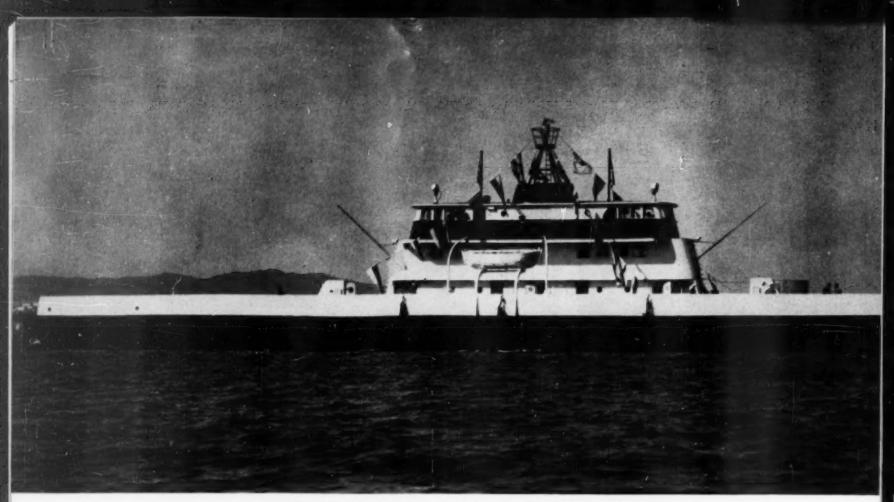
Mrs. Hoyt Taylor, wife of Kerr-McGee's chief drilling engineer, was sponsor of the Kermac II on the occasion of her recent christening. Kerr-McGee officials who attended the ceremony included D. A. McGee of Oklahoma City, president of the Kerr-McGee Industries; George Ketchell, vice president in charge of Gulf Coast operations; William Baxter, manager of Gulf Coast operations; Paul Wolff, marine architect; William Henderson, marine superintendent; Wayne Dean, manager of drilling from the company's Oklahoma City office; and Ken Parker and John Cox, drilling engineers.

Mud transfer pumps, driven by two General Motors 6-71 diesels, transfer drilling mud from the barge mud pits to the rig floor.

Capt. Neville Levy (left), president of Equitable Equipment Co., with President D. A. McGee of Kerr-McGee Oil Industries. Captain Levy presents a trophy to Mrs. Hoyt Taylor, wife of Kerr-Mc-Gee's chief drilling engineer. Mrs. Taylor was sponsor at Kermac II christening.



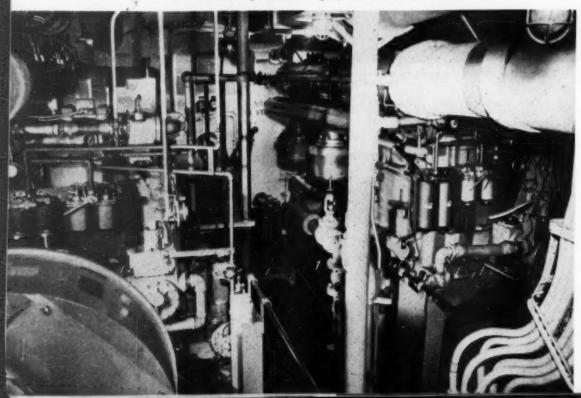




The diesel-electric ferry "Crown City" is 242 ft. long, has a beam of 65 ft. over the guards and a displacement of 995 tons at the design load line. It is propelled by three National Supply Co. Atlas Imperial diesels direct-connected to Westinghouse generators.

THE ALL-STEEL DIESEL-ELECTRIC FERRY "CROWN CITY"

Propulsion power is furnished by these 6-cylinder, 13 by 16-in., 515 bhp., model 76-S-6 Atlas Imperial diesel engines driving 300 kw., 250 volt Westinghouse generators. Auxiliary generator in left foreground is mounted on top of main generator. Note Nugent and Winslow filters at end of engine, also Titeflex metallic hose.



THE new all-steel ferry boat Crown City, owned and operated by the San Diego & Coronado Ferry Co., is equipped with diesel-electric drive to provide speedy commuting service between Coronado and San Diego. Operating schedule is based on a 20-minute round-trip cycle which includes loading and unloading at both terminals. Thus, the fast acceleration and deceleration of diesel-electric drive was needed to provide quick maneuverability.

Power for driving the *Crown City* comes from three National Supply Co. Atlas Imperial, model 76-S-6, 6-cylinder, 13 by 16-in., 515 bhp., naturally aspirated diesel engines direct connected to Westinghouse 300 kw., 250-volt direct current generators. The engines are of the constant fuel oil pressure, mechanical injection type using compressed air fcr starting. Constant fuel oil pressure is maintained in a common manifold, which feeds the cylinder spray valves, by plunger type pumps. The spray valves are mechanically

Prince Cott

tors. An auxiliary 45 kw. diesel generating unit in the engine room is available for normal service when the ferry is idle for inspection, and an emergency lighting generator driven by a Lister diesel goes on automatically in the event of a complete power failure.

Designed and engineered by Philip F. Spaulding & Co., Seattle, Wash., and built by the Moore Dry Dock Co., Oakland, Calif., the Crown City is 242 ft. long, and has a beam of 65 ft. over the guards, a molded depth of 171/4 ft., a draft of 111/2 ft. and displacement of 995 tons at the design load line. Its two propellers, one at each end, are 81/2 ft. in diameter with a 9.31 mean pitch. Each one is driven by a 1000 hp. electric motor. The double-ended vessel can carry 500 passengers and 70 automotive vehicles. Foot passenger accommodations are located in the island structure. The Crown City is equipped with two electric-hydraulic steering engines having safety relief valves on the hydraulic system to protect the rudder against striking underwater obstructions. By means of dual control, steering can be

accomplished from either the fore or aft pilothouse. Pilothouses also contain special radar equipment, propulsion motor control and control for both of the vessel's rudders.

In addition to the Crown City the San Diego & Coronado Ferry Co. operates four other diesel-electric ferries, two of which also use Atlas Imperial diesel engines driving Westinghouse generators. Ferry service is maintained on a 24-hour basis to carry between 7500 and 8000 passenger cars, buses and trucks over the half-mile course across San Diego Bay. The Crown City operates in continuous service with the other vessels taking care of the rush-hour traffic.

List of Equipment

Main engines—3 Atlas Imperial, model 76-S-6, 6-cylinder, 13 by 16-in., 515 bhp., National Supply Co. Engine Division.

Main generators—3 300 kw., 250-volt, dc., Westinghouse.

Propulsion motors—2 Westinghouse.

Switchboard-Westinghouse.

Engine silencers-Maxim.

Jacket water thermostat-Amot Controls.

Propellers-Coolidge.

Propeller shaft bearings-Goodrich.

Service generators—Westinghouse,

Air compressors—Quincy.

Auxiliary generator-Westinghouse.

Auxiliary generator engine-General Motors.

Water pumps-Fairbanks, Morse & Co.

Lube filters-Winslow duplex.

Emergency generator—Kurz & Root.

Emergency generator engine (Lister) — National Supply Co.

Supply Co.

Propulsion motor control—Westinghouse.

. Capstan-Markey.

Each pilothouse contains necessary compass, steering wheel and engine room signals as well as special radar equipment.



Emergency generator driven by a Lister diesel engine trips on automatically to furnish lighting and communications power in event main engines are idle or a power failure occurs.

operated through governor control, and are protected by edge-type filters.

All engine main bearings, crank bearings and piston pins are lubricated by means of a pressure feed system through the crankshaft and connecting rods. An engine sump pump takes used oil from the crankcase and delivers it to a bulkhead mounted day tank. A separate pressure pump takes the oil from the day tank and delivers it under pressure through filters and coolers to the engine lubricating system. Electrical service for the vessel is supplied by three 45 kw. Westinghouse chain-driven generators mounted on top of the main propulsion genera-

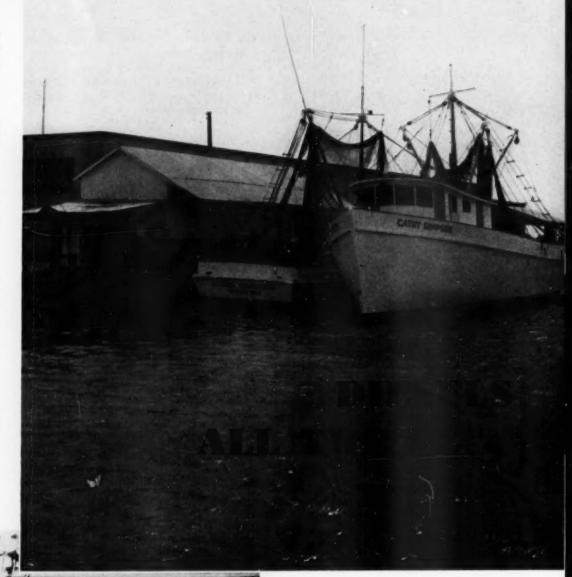


NE of the most modern shrimp processing and freezing plants along the entire Gulf Coast has converted to 100% dieselization as a result of several years' experience with diesel engines in shrimp trawlers. The plant is Crawford Packing Co., Palacios, Texas, owned by Carlton Crawford, former president of National Fisheries Institute and also former head of the Shrimp Association of the Americas.

Mr. Crawford is a pioneer shrimp producer who started in the business 30 years ago and developed his operations gradually into a canning plant. That was back in the days when there was little demand for fresh shrimp and quick-freezing had not yet come into practical use. Most shrimp was produced by small gasoline-powered boats fishing in the bays and within sight of land in the gulf. As demand for fresh shrimp increased and then as quick-freezing became a practical reality in the shrimp industry, Mr. Crawford switched from canning to selling shrimp either fresh or frozen.

Today shrimp come into Palacios and other Texas ports in modern diesel trawlers fishing as far at sea as the waters off Yucatan Peninsula, near the eastern tip of Mexico. Quick-freezing has made it possible for packers to deliver ex-

> Carlton Crawford, owner of a fleet of dieselized trawlers and the packing company bearing his name, checks GM diesel engine on the "Cathy Simpson," newest of 10 shrimp



cellent shrimp to the most remote hamlets of the United States, and the demand for the delicacy is greater than the supply. Mr. Crawford has kept in step with the growth of the industry. Shrimp production in Texas in 1948 was about 20,000,000 lbs. Last year it was 60,000,000 lbs. That growth has demanded an expansion in fishing methods and shore facilities. To meet this demand, Crawford Packing Co. recently completed a new combination shrimp processing-freezing-ice plant at a cost of around \$150,000. In keeping with progress, the new Crawford plant is completely dieselized.

To produce power for operating the processing facilities—conveyors, washing tanks and so on—the ice plant and the freezing plant, all under one roof, the company installed four General Motors diesel engines. They are 165 hp. each and are in banks of two. Two engines furnish all the power needed for operating the processing unit, the quick-freezing plant, the ice factory and the cold storage warehouse; but the two additional engines are ready for standby use in case of extra power needs or breakdown of the two engines in use. In fact, the four engines are rigged so that one; two, three or all four may be used as needed.

The ice plant has a capacity of 30 tons daily. The



LOAD-SENSITIVE GOVERNOR CONTROLS SPEED OF DIESEL GENERATOR SETS

Inet Engineers Redesigned Electro-Mechanical Unit to Simplify Construction and Operation

A N electro-mechanical load-sensing governor to control the speed of generators driven by gas or diesel engines is currently being exhibited and demonstrated to applicable markets by Leach

Corp. Named after its inventor, Olin P. Dupy, an exclusive license to manufacture and sell the patented governor was obtained by the Inet Division of Leach Corp., Los Angeles, Engineers then com-

pletely redesigned the governor from both the mechanical and electrical standpoints.

It appears that the most common dc. applications of the Dupy governor will be for: Aircraft ground power supplies, arc welders, searchlight control, jet engine starters, and battery chargers. Suggested ac. applications include 400-cycle and 60-cycle power supplies; radio, TV and telephone standby; marine, shipboard, and railroad engine generators; and oil field power supplies.

James Elliott, Inet sales manager, recently presented the redesigned Dupy governor to officials of aircraft manufacturing and supply firms, airlines, and the military services. He said: "The Dupy incorporates features that were designed to make the governor an essential component of any precisely controlled diesel or gas-driven engine power set. The governor not only is extremely simple in construction and operation, but it is efficient, inexpensive, and its use should greatly extend the time between engine overhauls."

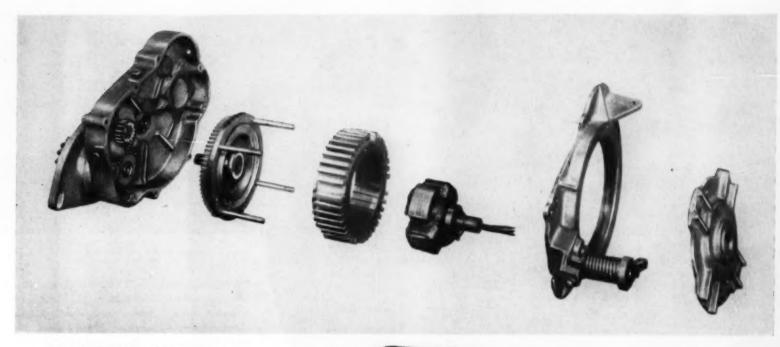
For engine-driven dc. applications, the function of the Dupy is to govern speed so as to maintain a fixed output voltage regardless of load. In ac. applications, it governs the engine to hold constant speed in order to maintain precise frequency. As designed for production, Mr. Elliott said, all castings have straight core pull, all gears are straight spurs, and all bearings are precision aligned.

The governor is described as "an inside-out synchronous motor." A squirrel cage outer case is rotated by a mechanical connection to the engine. A wound armature is mounted concentrically inside the squirrel cage but is restrained from turning by a spring. Electric currents passing through the armature induces the squirrel cage and produces an interacting magnetic torque. This torque causes an angular displacement against the spring restrainer on the armature. Thus a displacement indication of the currents passing through the armature is attained. This angular motion is transmitted by linkage to the throttle of the engine.

A second winding in the armature is made sensitive to the load on the generator by connections across the series field of the generator. This load sensing means that the Dupy can institute corrective measures with a change in load without having to wait for an actual drop in the output voltage. This anticipatory action results in faster governor re-

Electro-mechanical Dupy governor controls frequency of engine-driven alternators by controlling speed of prime mover. It also regulates voltage or current in dc. applications.





Above: Exploded view of Dupy governor, showing rotor field. Right: Control box used in ac. frequency control applications.

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Bottom—(Left) Schematic diagram of Dupy governor operation when used to control ac. frequency. (Right) This diagrams operation of the governor when controlling dc. voltage.

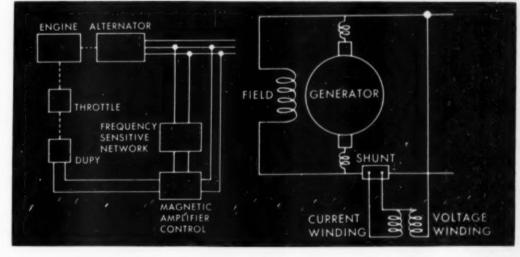
sponse and, in addition, provides damping which diminishes oscillation from load transients.

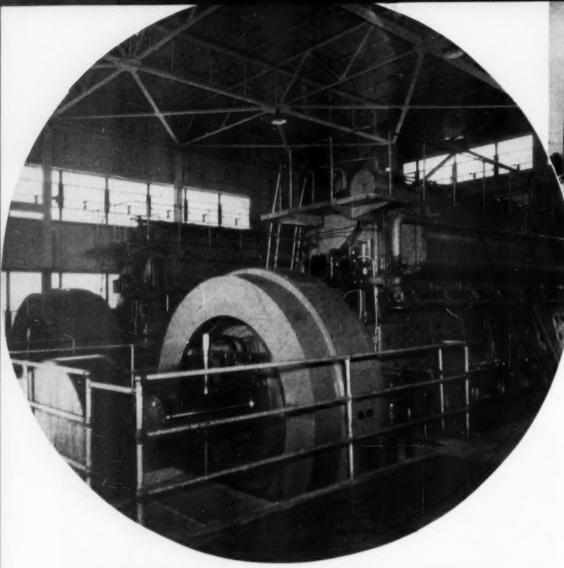
For ac. operation, the mechanical assembly is the same as for dc. However, one small control box is required. Four wires connect the box and mechanical assembly. In ac. control, a signal is taken from the alternator output. It is fed into a frequency sensitive network, the output being magnified by magnetic amplifiers. From the sensing network and amplifier, the signal goes to the winding. Voltage across the windings depends upon the error between the actual frequency of the engine-driven alternator and the desired frequency. This error is measured and controls the current in the Dupy winding. Thus, the governor acts to correct engine speed and to maintain the desired frequency,

The Dupy governor is normally driven from the engine timing shaft through a set of spur gears which reduce the speed of the rotating element to 150 rpm. Adapter pads are used to fit the governor to any type of gas or diesel engine. Mr. Elliott pointed out that the Dupy is truly electro-mechanical—that it uses no hydraulic fluids, no pumps, no plumbing, and no slip rings. He considers the rotor the only moving part, and points out that this minimizes mechanical maintenance problems and greatly increases efficiency.

In addition to its load-sensing ability, the Dupy is designed to share the load when two or more machines are operated in parallel. This is accomplished by the governor comparing the kw. load of each machine and signalling for a throttle correction to distribute the load on a percentage of the full load basis.





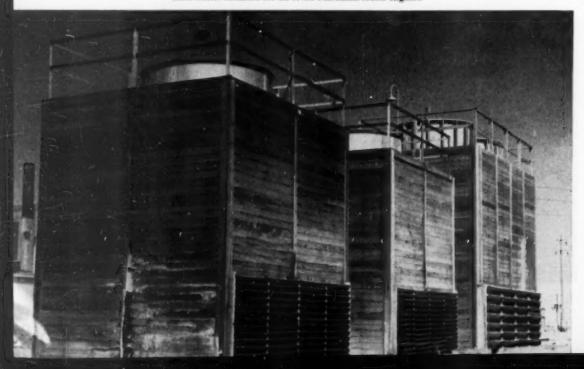


Closeup of two of the Lea county plant's four 3500 hp. Fairbanks-Morse dual-fuel engines. Since natural gas became available, the plant has cut its average fuel cost 60%.

LEA COUNTY CO-OP

Efficiency Keeps Pace With Rapid Growth
Of REA Plant in New Mexico

The three Marley induced draft cooling towers in which raw water is cooled before being returned to lube oil coolers and heat exchangers. The Marley Aqua-Tower at left serves intercoolers installed for all seven Fairbanks-Morse engines.



The newly formed Lea County Electric Cooperative of Lovington, N. M., hardly had a chance to get its three small Fairbanks-Morse diesel engines into operation in 1949 when suddenly the boom came. With more and more irrigation wells using motor-driven equipment throughout that section of southeastern New Mexico and western Texas, with oil discovered to the north and to the east of Lovington and with population and business booming, the REA co-op found that it had to expand even before it got started, and it had to expand fast.

Expansion proceeded at such speed that Lea county has been one of the fastest growing co-ops in the country, as well as one of the most efficient. The electric co-op began by building a beautiful new power plant, completing it in April, 1951. Then, in the space of only 34 months, ending last January, it installed and had on the line seven new Fairbanks-Morse dual-fuel engines, totaling 18,800 hp. Twice it had to extend the building to make room for the new equipment. As a result of this feverish expansion program, which is still far from complete, the Lea county co-op has increased its original 730 kw. generating capacity by 12,030 kw., both ratings at Lovington's 3900 ft. elevation. It raised its peak load from 1800 kw. to 8000 kw., reached last summer, and jumped its number of connected consumers from 1240 to 4600. Meanwhile, it raised the total mileage of energized line from 550 in 1951 to 1450 miles in 1953 and increased its annual production volume from 7,064,400 kwh. in 1951 to 24,707,300 kwh. in 1953.

At the time it was making these phenomenal increases in capacity and production the co-op was busy cutting its average fuel cost per kilowatt hour from 7.14 mils/kwh. in 1951 to only 2.87 mils/kwh. in 1953, a reduction of almost 60%. Chiefly responsible for this improved economy was the introduction of natural gas as a fuel in October, 1951, and improved engine efficiency. For the sake of better comparison, both of these fuel-cost averages are based on the current delivered prices of 19 cents per MCF of gas and 9.34 cents per gallon of diesel oil. Actually, in 1951 the cost of gas was 20 cents per MCF and diesel oil only 8.7 cents per gallon, making the plant's average 6.70 mils/kwh.



In only 34 months the Lea County Electric Cooperative at Lovington, N. M., installed and put on the line a total of 18,800 hp. in this modern power house.

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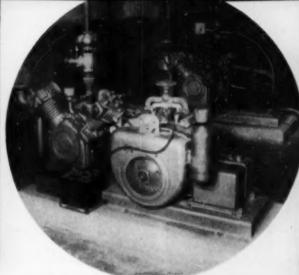
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R. B. Moore, general manager of the Lea county to op since it was established, is the chief force behind the plant's rapid expansion and success.



Starting air for the seven F-M engines is supplied by these Gardner-Denver V-type air compressors.

The boom first came to Lovington in February, 1947, when oil was discovered in the Sawyer field just north of the city. This was a year after the Lea county co-op was established and two years before it began full operations. Almost three years later, in rapid succession, five Denton oil fields, with 20 rigs, came in with geysers just east of Lovington. Meanwhile, the number of irrigation wells in operation swelled to more than 800, most of them equipped with motor-driven pumps of from 15 to 50 hp. The population of Lovington jumped from a normal 1916 in 1948 to well over 7500 in 1953. The city was transformed by the upsurge in activity. Happily, both city and power plant share an important characteristic: both have developed solidly and soundly. To meet the mushrooming requests for power, Lea County Electric Cooperative began to make hurried plans for expansion. It had bought the local system of the Inland Utilities Co. with the proceeds of its REA loan and was operating with 150 miles of energized line and three small Fairbanks-Morse diesel engines in 1949. These engines, one rated at 240 hp. and two at 450 hp., had a combined capacity of about 730 kw. at Lovington's 3900-ft. elevation (all subsequent kw. ratings will be given at the same elevation) and were carrying a sustained load of about 600 kw. Purchasing additional power to meet the demand, the system had a peak load of 1800 kw.

The first step in the expansion program was to supplement the old utilities building with a new power plant, installing two model 33FD16, 1600hp. Fairbanks-Morse dual-fuel engines in April, 1951, and adding a third F-M unit of the same size and type in May. The peak load jumped from 1800 kw. to 3500 kw. that summer and by the end of the year the three new F-M engines had delivered a total of 7,064,400 kwh. They operated on diesel oil until October, 1951, when the expected natural gas line came through. The co-op's generating capacity was increased by 3030 kw. with the addition of the three new engines and the mileage of energized line in service was built up to 550 miles. The plant now listed 2200 connected consumers on its books.

Meanwhile, the old plant continued to be used for peaking and it was still necessary to purchase additional power to meet the rising demand. In March, 1952, the plant knocked down its expansion wall and made room for two new engines. The first of these was a 3500-hp., model 31AD18 Fairbanks-Morse dual-fuel unit, placed on the line March 1, and the second was another 3500-hp. Fairbanks-Morse dual-fuel, of the same type, placed on the line Dec. 12. Both broke in on oil, the first for a period of 19 days and the second for 29 days, then switched to gas. By the time the first 3500-hp. unit went on the line, the co-op's investment had already reached \$1,750,-000 and all indications were that it would exceed \$5,000,0000 before the expansion program was complete. The new plant's generating capacity was now rated at 7530 kw., and in the space of just 20 months the co-op had installed and put on the line a total of five engines and 11,800 hp. The number of connected consumers had passed the 4000 mark, more than 1000 miles of line had been energized and by the end of 1952 the plant's annual production volume had jumped to 16,038,220 kwh., over twice that of 1951.

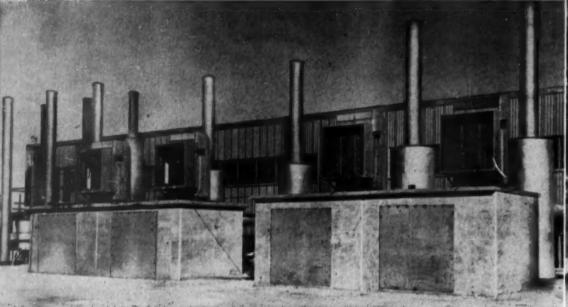
In 1953 the expansion wall was knocked down for a second time and two new Fairbanks-Morse dual-fuel engines were placed on order, both of the same size and type as the two 3500-hp, units installed the year before. Although they did not go on the line until last January, they represented the sixth and seventh F-M dual-fuel engines installed in a period of only 34 months, a total of 18,800 hp. which brought the plant's capacity up to 12,030 kw. In the course of 1953, with five engines on the line, the plant increased its production volume from 16,038,220 kwh. to 24,707,-300 kwh. Its number of connected consumers reached 4600 and its mileage of energized line 1450. The peak load was up to 8000 kw, and predictions were for 35,000 kw. by 1956.

Fuel economy of the five Fairbanks-Morse dualfuel engines installed as of Dec. 31, 1953, improved throughout the hectic expansion period. This, coupled with the savings introduced by the arrival of natural gas, sent fuel costs tumbling almost 60%. In 1951 the three 1600-hp. Fair-banks-Morse engines generated a total of 7,064,-400 kwh., mostly on diesel oil, and consumed a total of 499,295 gallons of fuel oil. Gas consumption from October through December amounted to 20,240 MCF. At a delivered price of 8.7 cents per gallon for oil and 20 cents per MCF of natural gas, this represents an average fuel cost of 6.70 mils/kwh. for the entire plant

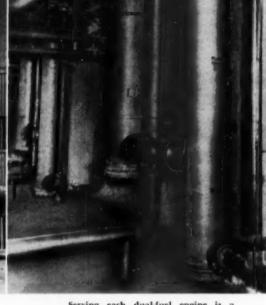
In 1952 the plant's fuel costs were cut 51%, from 6.70 mils/kwh. to 3.28 mils/kwh. Its total production costs, meanwhile, dropped 40.9%, from 11.15 mils/kwh. to just 6.59 mils/kwh. These figures are based on the same delivered prices for both oil and gas in both periods. In 1953, with no new engines being put on the line and with only one 3500-hp. unit operating on oil for a period of only 10 days, the plant's economy and efficiency improved sharply. In producing 24,-707,300 kwh., the five Fairbanks-Morse dualfuel engines consumed a total of 212,270 gallons of diesel oil and 269,990 MCF of natural gas. At a price of 19 cents per MCF of gas and 9.34 cents per gallon of oil, this represents a low average of 2.87 mils/kwh., 59.8% below the average in 1951 at the same prices. Total production costs, meanwhile, were cut more than 52% below the 1951 level, to 5.26 mils/kwh.

The year 1953 also marked a year of increased engine efficiency at the Lea county plant. With natural gas rated at 950 Btu. per cu. ft. and diesel oil at 143,038 Btu. per gallon, the five Fairbanks-Morse engines in 1953 averaged 11,-610 Btu./kwh., as compared to 12,832 Btu./kwh. in 1951. In 1953, the plant averaged 10.9 cu. ft./kwh. of gas and .0085 gal./kwh. of oil.

The seven Fairbanks-Morse dual-fuel engines currently in operation at the Lea county plant consist of three 1600-hp., 300 rpm., model 33FD-16s and four 3500-hp., 277 rpm., model 31AD-18s. Each of the 1600-hp. units has eight cylinders of 16-in. bore and 20-in. stroke and drives a 1010-kw., 3-phase, 60-cycle, 2400/4160-volt alternator. They are equipped with 20-kw., v-belted exciters. Each of the four 3500-hp.,



Rear view of Lea county plant shows Maxim exhaust silencers serving dual-fuel engines and the American air filters.



Serving each dual-fuel engine is a Ross heat exchanger, equipped with individual thermostatically controlled by-pass valves.

277 rpm., Fairbanks-Morse units has 10 cylinders of 18-in. bore and 27-in. stroke and drives a 2250-kw., 3-phase, 60-cycle, 2400/4160-volt alternator. These big alternators are equipped with 30-kw., 125-volt, shunt-wound exciters, v-belted to the alternator shafts and driven at speeds of 1450 rpm. As already noted, all generator ratings are derated at Lovington's 3900-ft. elevation.

Natural gas arrives at the Lea county plant at a pressure of 65 psi., passing successively through two scrubbers, a recording meter, a temperature recorder and through pressure regulators before reaching the individual meters and regulators at each engine. This procedure reduces the gas pressure to 16 psi. as it enters the engines. Fuel oil is delivered at the plant by truck and is unloaded into two 20,000-gallon storage tanks through a visible-register meter by a $2\frac{1}{2}$ -in. 3-hp., motor-driven pump. From these storage tanks the fuel is directed through individual cellulose-packed filters to seven day tanks.

Jacket water temperature is kept within prescribed limits by individual thermostatically controlled by-pass valves, which are air-operated and which by-pass water around the heat exchangers as needed. Similar valves are installed in each engine's lube system, by-passing lube around the coolers. Raw water for the plant's heat exchangers and oil coolers is drawn from the same two wells supplying makeup water and is similarly treated in the plant's water softener. It is circulated by three 4-in., 10-hp., motor-driven pumps serving the 1600-hp, engines and by four 6-in., 25-hp., motor-driven pumps serving the 3500-hp, engines. Cooling is handled by three induced-draft cooling towers. A fourth tower has been built to serve new intercoolers installed on all seven engines. Scavenging air for each of the smaller engines is drawn through a horizontal intake silencer and through a pair of oil-bath type filters by a built-in, engine-driven blower. Air for each of the larger engines, meanwhile, is

drawn through a similar intake silencer and through a self-cleaning type filter and supplied to the cylinders by a 24-in. motor-driven blower, each having a capacity of 17,700 cfm. and with a discharge pressure of 2.86 psi. These blowers are driven by 300-hp., 3550 rpm. electric motors, connected to their respective generators by direct line. In starting operations, a battery is used to force the field of each generator, thus inducing sufficient current to start the blower motor.

Starting air is supplied by two 61/4 by 51/2, v-type air compressors, one v-belted to a 15-hp, induction motor and the other to a gasoline engine. Exhaust gases are expelled through vertical silencers, mounted on the rear outside wall. Individual gauge boards, located conveniently near each engine, are equipped with multi-point exhaust pyrometers, control switches for the before-and-after lube pumps, the fuel booster pumps and the jacket and raw water pumps, plus a full set of gauges on jacket water pressure and temperature, raw water pressure, lube pressure and temperature, fuel oil pressure, gas pressure and starting air pressure. Alarms are included on jacket water pressure and temperature, lube pressure and temperature, fuel oil pressure, gas pressure and on the day-tank levels.

Much of the credit for the success of the co-op must go to General Manager R. B. Moore, who has been with the co-op since its beginning and who was manager of the local utility at the time the co-op was first established. Mr. Moore is assisted by Clyde R. Price, chief electrical engineer and power plant superintendent; Bert Haggerton, chief diesel engineer; C. B. Hailey, superintendent of lines; and K. C. Martin, office manager. Mr. Price was design engineer for the entire plant, handling the first 4-engine section while in the employ of the Continental Engineering Co. and designing the second 3-engine section after joining the co-op in 1950 as chief electrical engineer and power plant superintend-

ent. Officers of the co-op are Kyle Taylor, president; R. E. Willingham, secretary-treasurer; and Hubert Gill, Grady Richards, Tip Barnes, J. E. Wildman, Mrs. Ruth Patterson, Marvil Powell and L. L. Coats, directors.

List of Equipment

Engines—(3) Model 33FD16, 1600-hp., 300 rpm., 8-cylinder, 2-cycle, 16 in. by 20 in. dual-fuel engines. Fairbanks-Morse; (4) Model 31AD18, 3500-hp., 277 rpm., 10-cylinder, 2-cycle, 18 in. by 27 in. dual-fuel engines. Fairbanks-Morse.

Alternators—(3) 1262-kva., 1010-kw., 3-phase, 60-cycle, 2400/4160-volt, alternators, rated at 3900-ft. elevation. Fairbanks-Morse; (4) Type TGZO, 3055-kva., 2250-kw., 3-phase, 60-cycle, 2400/4160-volt, .8 pf., alternators, rated at 3900-ft. elevation. Fairbanks-Morse.

Exciters—(3) 20-kw. Fairbanks-Morse; (4) 30-kw. Fairbanks-Morse.

Governors—Woodward.

Intercoolers-Marley.

Heat exchangers-Kewanee-Ross.

Lube oil coolers—Kewanee-Ross.

Raw water cooling towers-Marley.

Water softener—Texfilco. Texas Filter Co.

Thermostatic control valves-Powers Regulator.

Fuel oil meters-Rockwell.

Fuel oil filters-Midwest Filter.

Natural gas scrubbers-Blaw-Knox.

Natural gas temperature recorders-Bristol.

Gas meters and regulators-Rockwell.

Before-and-after lube pumps-Roper.

Lube oil filters-Midwest Filter.

Scavenging air blowers-Roots-Connersville.

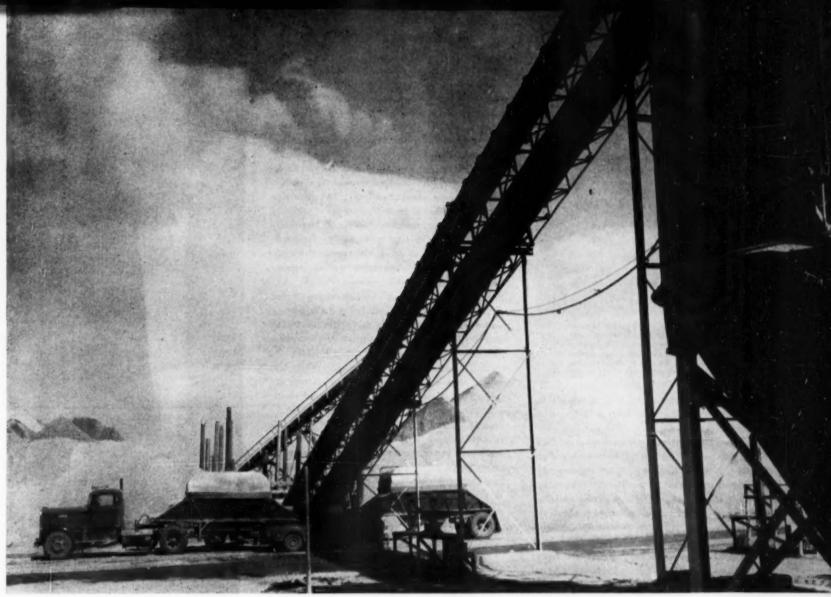
Air intake filters—American Air Filter.

Air intake silencers—Maxim.

Exhaust pyrometers-Alnor.

Air compressors—Gardner-Denver.

Switchboard—Westinghouse Electric Corp. Lube oil—Texaco Ursa X30**



Cement comes to Plant 42's construction site batch plant (Noble) in diesel-tractored double-trailers, capacity 125 bbls.

DIESELS IN NEW AIRCRAFT CENTER

EARING completion at Palmdale, Calif., is USAF Plant #42, the U. S.'s biggest cooperative "air plant," jointly tenanted by three major Southern California airframe manufacturers. Plant #42 is a giant. Its 10 buildings (covering about 1,000,000 sq. ft.) are scattered over 4864 acres. Factory buildings, common utilities (sewage, water and electricity) and a 12,000-ft. runway represent a \$15,000,000 investment. However, long term estimates of Plant #42's worth (envisaging three additional 12,000-ft. runways and more buildings) exceed a total of over \$30,000,000.

Plant #42's official name, Production and Test Facility, explains its function. Not explained, however, is the reason for its location some 60 miles north of Los Angeles. The reason: jet engine noise has forced airframe builders to seek the wide-open spaces. Plant #42 is both wide and open. And dieselwise, it's quite a story. At Northrop Aircraft's main building, the installation's largest, a 275 hp. GM (Detroit) diesel driving a Delco 150 kw. electric generator (Seco motor-generator set) acts as standby. The en-

By JAMES JOSEPH

gine takes over its emergency load automatically within six seconds after power line failure.

And out on the airstrip-jointly used by Lockheed, Northrop and North American (Plant #42's present tenants), diesel rigs have lengthened existing runways, moving 700,000 cu. yds. of earth. More than that, they've been fighting through dust and high winds. The Palmdale airport, incorporated into Plant #42, is surrounded by low-lying mountains which seem to channel the prevailing southwest winds averaging 20 mph., but often reaching 30-40 mph. Sonic-speed jets, nosing upwind for a landing, are slowed by strong air currents, one reason why the Air Force located Plant #42 at Palmdale. While this might be ideal for jet aircraft, it's rough on diesel equipment and their operators. When DIESEL PROGRESS visited the construction, only the earthmovers were operative in a 35 mph. gale. The concrete laying operation had been shut down.

"We've lost four out of 20 days already this month," a diesel truck operator shouted against the gale. "Blows the concrete into the next county." But snug in Northrop Aircraft's main building, the diesel standby wasn't feeling the wind. Northrup's main building covers 188,784 sq. ft. It's really three plants in one. Under a common, steel-corrugated roof there are (1) a clear span assembly area, 552 by 150 ft., (2) a 4-story office building isolated from the main structure, and (3) a 2-story radar test building, similarly isolated. The plant's emergency lighting, its refrigerators which cool rivets, various fire-fighting pumps and injector controls on oilburning hot-water boilers are hooked to the diesel's standby circuit. The engine is located in one corner of the power room adjacent to the boilers. Essentially, the motor-generator set consists of a General Motors Detroit 6-110, model 62300 RA, 275 hp. diesel engine, directly coupled to a Delco 150 kw., 187.5 kva., 60 cycle, 416/480volt generator. At the generator end is a control board, which includes a Burlington Synchrostat voltage regulator. The diesel itself is a 2-cycle, 6-cylinder unit, rated 275 hp. at 1800 rpm., with

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Diesel fuel from a 318-gallon tank is pumped into a 10-gallon day tank via this Worthington rotary 2 GAU pump direct connected to a GE ½4-hp. motor. Fuel is for the Seco diesel-electric standby set.

a bore of 5 in., a stroke of 5.6 in., a 660 cu. in. displacement. Compression ratio is 18:1.

Northrop's George Newell, maintenance foreman, points out that the generator set's compactness is a big advantage. The engine-generator is mounted with its automotive-type radiator housed directly behind a screened and louvered section. The engine-mounted pusher-type fan removes hot air from the room, while two Donaldson oil-bath cleaners filter engine air. A Kittell silencer is installed within the boiler room, with exhaust exiting via an asbestos-covered pipe leading to the power room's free-standing, unsupported stack.

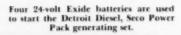
Fuel for the diesel comes from an underground 318-gallon tank. Diesel oil is pumped from this tank via a Worthington rotary 2 GAU pump directly connected to a GE 1/4-hp. electric motor. The motor is powered both from line power and from the generator. Fuel is pumped from underground storage to a small day tank (holding about 10 gallons). Mounted near the engine, but on the boiler room wall, is a Petrometer (fuel meter). Under full load, the power pack uses 9-10 gallons an hour. The pack, which starts under what is essentially its full load, gets startup power from 4 24-volt batteries, trickle charged at the rate of 0.5 to 3 amps. Importantly, the unit is completely automatic. It's equipped with automatic cranking controls, automatic choke, speed regulating governor, low oil pressure, high water temperature and overspeed protection, trickle charger, immersion heaters and has a voltage regulator on the ac. generator. The starting solenoid's points are held open while regular power is on. When line power goes off, or falls to a predetermined level, solenoid contacts close, actuating the starter. When the points again open - the regular power goes on - the General Motors diesel engine stops.

Specifically, the Seco set is provided with Salyers Equipment Co. automatic engine starter controls. They consist of relays and time delays to permit cycling cranking with an indicator light

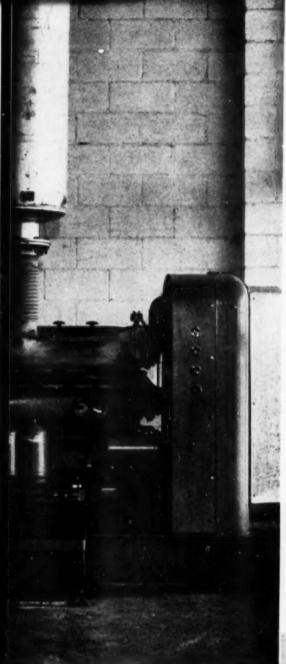
denoting failure to start. Cycling starting involves four to six attempts to start, of approximately 15 seconds duration each, with 5-second rest periods before disconnecting the battery from the starter motor. The voltage regulator (mounted on a vibration isolating housing above the generator's rear end) maintains voltage within 3% from full load to no load and from no load to full load. A Pierce overspeed governor acts to prevent engine run-away. The governor is mechanically driven and actuates a solenoid operating a lever connected to the airbox door, causing positive shutdown in case of overspeed. The governor shuts down the engine if speeds are in excess of 110% operating rpm. Overspeed controls can be manually reset.

Not only does the engine's fuel pump supply the six injectors (at about 40 psi.), but it also pumps 5 to 10 times the amount of fuel necessary to operate the engine. This surplus fuel oil helps cool the injectors, circulates through them, returning to the auxiliary reservoir. When the engine idles, nine tenths of the fuel is used as coolant. At top speed (1800 rpm.), injectors burn a fifth of the fuel received. The rest becomes coolant. Northrop runs the engine about 10 minutes every 7-10 days, just to keep it operative and ready. An immersion heater, installed in the water by-pass line, holds engine water temperature at a contsant 110-120°F.

The Seco Power Pack, diesel-electric standby at Northrop Aircraft Co.'s Plant 42 main building. A 275 hp. GM (Detroit) diesel drives a Delco 150 kw. generator.







Says Art Davison, Northrop maintenance leadman, "The standby operates emergency lighting and plant essentials. Any major power failure would shut us down, production-wise. But plant essentials, including the radar building's elevator, would remain operative." Meanwhile, out at the airstrip, diesels have been star performers in a major piece of construction. There, joint venture (general) contractors Early-Stolte Inc. (Fred J. Early Jr. Co., Inc., San Francisco, and Stolte, Inc., Oakland, Calif.) have, with a half dozen joint-venture sub-contractors, been lengthening an existing runway and building taxiways to each tenant plant.

The existing runway, 7000 ft. long and 150 ft. wide, was slated to be lengthened to 12,000 ft., widened to 200 ft. Several miles of 75-ft. taxiways are also going in. Pereira-Luckman plans call for four runways, each 12,000 ft. These will dwarf similar facilities at most present-day airports. Runways can handle everything from jet fighters to the heaviest of bombers. The 700,000-cu. yd. earthmoving job has utilized more than 150 pieces of heavy equipment, mostly dieselized, and this equipment is giving a new look to airstrip construction. Whereas the existing Palmdale runway, typical of most U. S. airports, has a total graded width (including strip and shoulders) of but 500 ft., the new strip is 1500 ft. wide.

Why three times the formerly "acceptable" width? Because of what the Air Force calls "uncontrolled conditions," such as when a jet, rocketing in for a landing goes out of control. The

High winds and dust make it necessary for diesel tractor operators to wear goggles and sometimes respirators. Dieselized equipment perform with a high level of efficiency under these severe conditions.





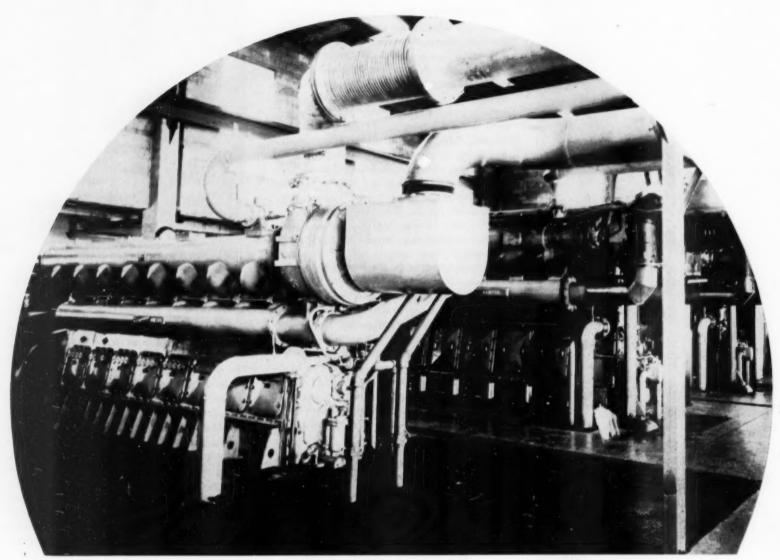
A Northrop maintenance man checks Petrometer on wall near diesel standby. Meter tells amount of fuel remaining in underground tank.

1500-ft. widths are needed as an extra margin of safety for today's supersonic aircraft.

To thwart wind and dust, diesel equipment operators (in some cases) wear goggles and respirators. You get some idea of wind strength when you consider that designers figured graded areas would lose about three inches of topsoil, simply from wind erosion. Set up to handle the peak daily concrete pour of 3000 cu, yds, was a double Noble batch plant. The plant has been supplied aggregate from three sources, some as far as eight miles away. Sub-contractor Lee Stephens Construction Co. hauled much of the aggregate in a fleet of 10-cu.-yd. bottom dumps, hooked onto a variety of diesel and gasoline tractors (Kenworth, International, Ford). Charles Brown of Tehachapi (cement haulage sub-contractor) has brought cement 50 miles from Oro Grande, Victorville and Monolith, using Kenworth tractored, double trailers of about 125bbls. capacity. His rigs can make the 100-110 mile roundtrip in about 31/2 hours.

One interesting construction cost-saver has been the use of two Rex double-drum 34-E's in tandem that is, working side by side (although one is actually a few yards ahead of the other so that booms won't interfere). Rexes are powered by GMC 471 diesel engines. Working tandem, Early-Stolte can use one instead of two finishing crews. How effective this has been can be seen from the maximum 2013-cu.-yd. pour in 9 hours, although 3000 cu. yds. is the ultimate and expected pour. Working in conjunction with the double-drummed Rexes (each 34-cu.-ft. capacity) have been: a Multifoote 34-E single drum mixer (for follow up); a Blaw-Knox 25-ft.-wide spreader; a modified Jacger-Lakewood 25-ft. finisher; and a Flexplane joiner.

Wind has caused the most trouble. Battling gusts up to 55 mph. has been a host of noteworthy equipment, including (1) a Cedarapids 60,000-lb. vibratory compactor, 8 ft. wide, pulled by a D-8; (2) Euclid tractored motor-driven water sprayers; and (3) International and Caterpillar big capacity scrapers.



A fourth Superior diesel was installed recently in the Petoskey municipal power plant. It provides 25% more power than each of the original engines, installed in 1948, increasing plant capacity from 3000 to 4250 kw. An Elliott turbocharger is shown on the new engine with a General Electric generator at the far end.

PETOSKEY, MICHIGAN

THE fourth power unit installed recently in the 5-year-old municipal power plant at Petoskey, Mich., is a 1765 hp. turbocharged diesel driving a 1250 kw, generator. This unit, with 25% more power than each of the original three installed in 1948, increases plant capacity from 3000 to 4250 kw.

The new diesel engine is a Superior model 65-SX-8, one of the newer developments of the National Supply Co.'s Engine Division, Springfield, Ohio, which reflects the trend toward higher power outputs from a given size of engine. It is a heavy-duty 8-cylinder, 4-cycle engine with 1234-in. bore and 15-in, stroke, operating at 600 rpm. Fabricated steel construction in bedplates and cylinder block, higher speed (accompanied by generously proportioned camshaft and crankshaft), higher bmep, and reduced bore and stroke permitted installation of a higher powered engine in less space than that occupied by each of the three original Superiors.

During the year preceding installation of the new power unit, electric power demand of 11,353,000 kwh. was one-third over initial requirements of the plant. Net profit on the power system was more than \$100,000 per year. A small part of this power was produced by three hydro plants with a total capacity of 700 kw. from a limited water supply.

During it first month of operation the new power unit operated 351 hours, generated 305,000 kwh., and consumed 21,600 gallons of fuel oil, which is equivalent to 14.1 kwh. per gallon of fuel. No lubricating oil was added and plant officials believe that the engine will average at least 12,000 horse-power-hours per gallon of lubricating oil. Fuel oil storage capacity of 100,000 gallons is provided at a distance that requires 200 ft. of piping. No. 4 Michigan gas oil is supplied by a refinery at Mt. Pleasant, Mich. This fuel has a calculated Btu. rating of 139,773 Btu. per gallon and a diesel index of 58.3. Specific gravity is 0.8565.

The Petoskey city labor force mixed and poured the concrete foundation for the new engine under the supervision of the superintendent of the municipal light plant, thus making a considerable saving to the city. Other contracting charges were eliminated by having the plant superintendent supervise the wiring of the addition to the switchboard.

List of Equipment

Engine-1765 hp., Superior model 65-SX-8, National Supply Co.

Generator-General Electric Co.

Exhaust silencer-Maxim.

Air filter-American Air Filter Co.

Air intake silencer-Air-Maze.

Flexible pipe-Flex-Metal Hose Co.

Fuel transfer pump-Roper Corp.

Fuel meter—Niagara Electrical Instrument Co. Instrument cabinet—National Supply.

Governor-Woodward.

Lubricating oil thermostat-Amot Controls.

Lubricating oil filter-Hilliard.

Lubricating oil sump tank standby pump-Roper Corp.

Turbocharger-Elliott Co.

National Motor Boat Show

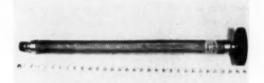
Space applications for the coming 1955 National Motor Boat Show which will be held in New York's Kingsbridge Armory January 14th to 23rd, have exceeded space available despite the fact that 4,000 square feet have been added to last year's floor plan, according to Joseph E. Choate, show manager.

When final allotments are made, there will be more than 225 exhibitors of boats, marine engines and nautical equipment assigned space in this second show staged at the Kingbridge Amory. For the first time in its history, the show will be open on two successive Sundays in its ten day run thus permitting out-of-town visitors greater opportunity to visit the exhibits. In conjunction with the show, many national boating organizations will hold their annual meetings in New York City.

Special dealer hours will be conducted Monday through Friday, January 17-21, from 11:00 a. m. to 1:00 a. m. after which the show will be open to the public. Admission during these hours will be by special dealer pass obtainable only through the exhibiting manufacturers.

The Kingsbridge Amory at Kingsbridge Road and Jerome Avenue in the Bronx is a colossus with the world's largest unobstructed, roofed-over area, 180, 000 square feet. This is equal in size to four football fields. The main exhibition area is surrounded by a balcony seating 3,000.

"The Diesel Peacemaker"



Pictured above is a Cobra metal hose for use on a diesel engine. Specializing in the manufacture of metal hose for tough applications, the Cobra Metal Hose Division of DK Manufacturing Company manufactures hose for applications involving high temperatures, highly corrosive conditions and severe vibration.

The role of "peacemaker" is involved where the vibration of an engine is to be isolated from other parts to which the vibration cannot be transmitted without serious damage to the various components. Metal hose is important to engineers when they have a vibration, movement, expansion or other transfer problem that rubber cannot meet.

Cobra Metal Hose is corrugated from seamless tubing by a process that gives an even-wall highly flexible hose without any weak spots or joints thus eliminating structurally weak spots due to bending for a joint or heating for a welded seam. For further and more complete information, write to Cobra Metal Hose Division, DK Manufacturing Company, 4640 West 54th St., Chicago 32, Illinois.





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HAT'S GOING ON IN ENGLAND

CONDUCTED BY HAMISH FERGUSON .

Hamish Ferguson received his training and early experience with the English Electric Company. Subsequently, he spent a number of years with a firm of diesel engine consultants, London, and in 1944 became secretary to the Diesel Engine Users Association. In 1953, he relinquished his appointment to devote his time to private consulting work connected with diesels and gas turbines.

ENGINE PROTECTION

THERE is hardly any limit to the extent to which instrumentation and automatic control can be applied to a diesel engine providing an electrical circuit can be energized. Temperatures and pressures in any part of the engine, and the fluids passing through it, can be thermostatically controlled within predetermined limits and they can be instantaneously or continuously recorded. Should the limits be exceeded, alarms can be arranged and these in turn can be coupled up with automatic shutdown devices. Every diesel user would, of course, chose a fully protected engine if this were offered at similar cost and occupied no greater space than its unprotected equivalent. But, inevitably, protection equipment is a refinement rather than an absolute necessity and it must occupy some space and its cost must be regarded as an extra. It becomes necessary, therefore, to consider the extent to which the adoption of protection equipment is economically justified. There are three basic causes for the failure to function of an unattended and unportected engine. These are overspeeding, overheating, and underheating, Considering these individually:-

Overspeeding. This will only occur due to govenor failure. Simple automatic devices, either mechanically or electrically controlled, are available which will cause the engine to shut down before a dangerous speed is reached.

Overheating. This may result from any one of a number of causes or a combination of causes which include faulty combustion of the fuel, failure of the cooling water supply, and inadequate lubrication.

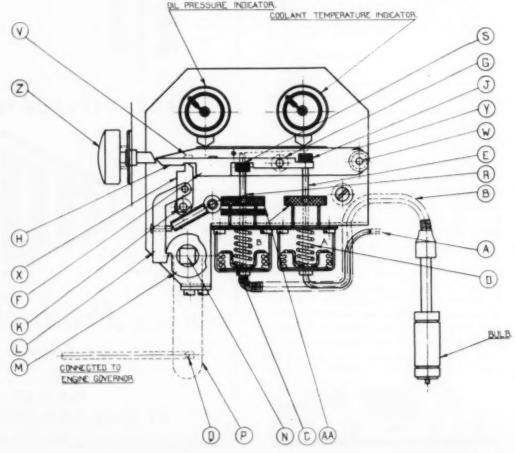
Underheating. Since the only source of heat in the engine is derived from the fuel supply or to faulty combustion. In either case the result will be engine stoppage and it is most unlikely that any damage will result; so that this factor can be ignored from the protection point of view.

Thus the general factor of overheating is the one to be guarded against. If overheating is due to faulty combustion, cylinder temperatures will tend to rise and the additional heat will cause an increase in the cooling water temperature. If the cooling water flow becomes reduced a similar effect will become apparent. Should the supply of lubri-

cating oil become restricted there will be danger of seizure in the bearings or cylinders. Under these conditions damage would be liable to occur before the defect would be detected by a rise in oil temperature, so that the factor of oil pressure is a better guide.

Teddington Type OV Engine Watcher. The device is designed to protect any engine which can be stopped by releasing the stop lever of a mechanically operated fuel pump or injector. It provides protection against loss of lubricating oil pressure or a dangerous rise in coolant temperature. The release mechanism is actuated by the movement of two flexible bellows units, one connected to the lubricating oil system and the other to a bulb suitably charged, using the vapour-pressure prin-

ciple, to respond to temperature changes. The bulb is inserted into the water jacket. If the lubricating oil pressure falls to danger level the pressure in bellows A will be insufficient to overcome spring D and the bellows will therefore be pushed downwards causing push rod E to move in the same direction. The collar I connected to push rod E then forces arm F to rotate clockwise around pivot G and lift catch H. This releases latch X thus allowing arm P (integral with cam M) which is connected to the engine governor stop lever, and spring loaded, to move to the 'stop' position. Similarly, should the coolant temperature rise to a dangerous level, the resulting increase in vapour pressure in the bulb will be transmitted via capilliary tubing to bellows B. Expansion of the bellows unit will cause push rod R to move arm F clock-



wise around pivot G as in the case of low oil pressure, and this will again release the latch mechanism to move the lever arm to the 'stop' position. As the power available from the bellows is limited, a toggle catch L is used to decrease the load on the latch mechanism.

Two fault indicators are built into the assembly to show cause of shut-down. These are in the form of pointers driven by rack and pinion. The rack for the lubricating oil failure indicator is moved by an arm actuated by rod E so that when the oil pressure falls the pointer moves from the 'normal' to the 'danger' sector of the dial. The operation of the coolant temperature indicator is similar, the rack being moved by an arm actuated by rod S. Friction clamps 'freeze' the indicators once the unit has shut down the engine.

To enable the engine to be started without oil pressure, an auxiliary catch V is employed to retain latch X. As the oil pressure rises rod E moves this catch upwards allowing the latch to engage with the main catch in which position the engine is then fully protected. A puch button Z is provided for manual shut down when required. This button when depressed lifts catches H and V. Resetting arm P to the start position frees the friction clamps on the fault indicators allowing them to take up their appropriate positions. Collars AA are drilled for adjustment by tommy bar to vary the load on the bellows and thus raise or lower the trip settings.

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With engine protection available in this highly simplified form it would seem well worthwhile to adopt it as a standard fitting on engines which have to run unattended for any length of time. In the majority of cases it would never be called upon for emergency shut down, and for this the user would be thankful. He is quite happy to pay premiums to insure his property against the risk of fire and is most happy of all when there is no necessity to make a claim.

New Enterprise General Manager



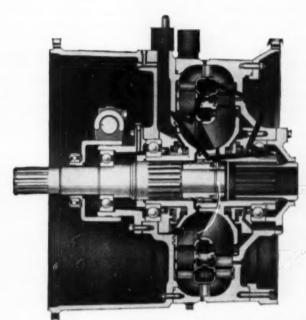
Wm. Clausen

William Clausen has been named executive vice president of General Metals Corp. and general manager of its Enterprise Engine and Machinery Division. The appointment was announced by William E. Butts, General Metals president, Mr. Clausen was vice president and general

manager of Sangamo Electric Ltd. of Canada, with headquarters in Toronto. Prior to his connection with this heavy equipment manufacturer, he held top management positions with other leading capital goods manufacturers.

Distributor-Dealer Manager Named

Detroit Diesel Engine Division of General Motors has appointed S. G. Morse as manager of its distributor and dealer organization and analysis department. Mr. Morse formerly was factory representative in the division's Cleveland sales zone. H. E. Smith replaces him in that territory.



Twin Disc free wheel locks impel ler and turb in together to provide absorption or braking horsepowe by the converter. It locking the impelle to the furbine, the free-wheel force the truck's diving axle to turn the converter pump wheel — providing smooth, power ful Hydrodynamic Broking.

The Torque Converter with Built-in Braking!



This Dart Model 140 mining track (above) climbs 15% grades with 22-ten payloads in one gear—comes back down without pedal-braking—by utilizing up-ta-6:1 Cenverter Drive and built-in Hydradynamic Braking of Twin Disc Model CF Three-Stage Track-Type Tarque Converter (shown above in cut-away). Request Bulletin 501.

When you specify torque converters for your heavy-duty off-highway trucks, be sure to get the extra advantages of Twin Disc Three-Stage Truck-Type design, with built-in Hydrodynamic Braking at the extra contraction.

drodynamic Braking at no extra cost.
Pioneered by the Twin Disc Clutch
Company, Hydrodynamic Braking in
the Model CF Torque Converter is
actuated automatically when the operator lets up on the accelerator. No
accessory equipment or additional
cooling system for braking is
required.

Here is the most effective Torque Converter downhill retarding ever developed . . . smooth, effortless braking that gives your operators complete control all the way down. And by combining built-in Hydrodynamic Braking with friction braking of the engine, Twin Disc offers maximum downhill retarding without sbock-loading the transmission.

shock-loading the transmission.

Add the powerful torque multiplication of Twin Disc Three-Stage design (up to 6:1 at stall, highest in the field) and you have virtual elimination of uphill shifting as well as of downhill pedal-braking . . . providing faster work-cycles with more payloads bauled per day—lower ton-mile costs—and savings on engine, tires, brakes, and drive-line components.



TWIN DISC CLUTCH COMPANY, Racine, Wisconsin Hydraulic Division, Rockford, Illinois

LMOA Association Meetings

The Locomotive Maintenance Officer's Association are not having a national Chicago meeting as in previous years. In its place they have arranged for a series of "Conventions-At-Home Discussions" programs. These discussions at home have taken place since early October and will run through January, 1955. They have already taken place in different cities, Chicago, San Antonio, St. Paul, Buffalo, St. Louis, Detroit and Louisville.

Still to occur are the Jacksonville and Denver meetings. The Jacksonville meeting will take place December 14, 10:00 a.m. at the Southwestern Railway Diesel Club, Mayflower Hotel in Jacksonville, Florida. The topic will be "Training Supervisors and Mechanics in Diesel Locomotive Maintenance." Carl A. Love will act as chairman. The Denver meeting on January 24, 1955, 7:30 p. M. will be held in Denver, Colorado. The subject of the evening will be "Uniform Flow and Handling Material in a Centralized Diesel Shop." The meeting will be chaired by E. L. Neeley.

Exhibitors Should Reserve Space

Diesel accessory suppliers who plan to exhibit their products at the annual convention of the Oil and Gas Power Division of the ASME are urged to apply immediately for space reservations. All requests should be directed to John A. Worthington. convention chairman, P.O. Box 626, Baltimore, Mr. The 1955 meeting will be held in the Statler Hotel, Washington, D. C., June 5 to 10 inclusive. Attendance at these annual sessions is made up largely of engineers from engine manufacturing plants, pipeline pumping stations, municipal plants, public utilities, and transport companies.

The theme of the meeting will be "Oil and Gas Power for National Defense" and the Local Committee has been organized as follows: Vice Admiral Roscoe F. Good, deputy chief of Naval Operation (Logistics) will act as chairman; Charles G. Cooper, vice president, Cooper-Bessemer Corp., Washington, D. C., will serve as vice chairman; and Prof. A. Wiley Sherwood, Aero Dynamics Dept., University of Maryland, College Park, Md., will be chairman, local section, OGP.

Promoted to Sales Engineer



C. T. Duke

Promotion of Clarence T. Duke to sales engineer of the C. Lee Cook Manufacturing Co., Louisville, has been announced by Philip W. Mettling, vice president. Mr. Duke has been with the company for 18 years in the production, purchasing, engineering and design departments.

He will sell Cook industrial piston and packing rings in Michigan, Wisconsin, Indiana and the state of Kentucky.

Sales Publication Wins Award



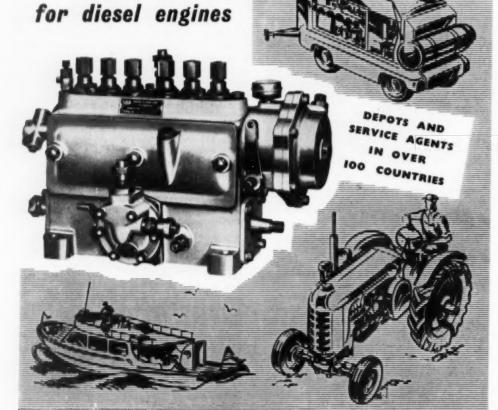
Editor Victor LeMay (second from right) looks over over McCormick-Armstrong award presented to the Cummins Bulletin, of which he is editor. Examining the plaque with Mr. LeMay are (left to right) President John Solomon of Society of Associated Industrial Editors, Kansas City; Awards Committeewoman Peggy Gunderson, Salt Lake City; and Awards Chairman Jack Raglin of Continental Oil Co., Houston.

The Cummins Bulletin, sales publication of Cummins Sales & Service, Inc., Forth Worth, has won a top national award for promoting its company and products. The McCormick-Armstrong award and plaque, top prize given by the Society of Associated Industrial Editors, was presented to Editor Victor LeMay at the group's recent convention in Salt Lake City. It was one of three honors won by the magazine. Others were for all-around editorial achievement.

Another magazine published by LeMay for Mid-Continent Supply Co., The Mid-Continent News, received the society's award of merit, which Mr. LeMay also accepted at the convention. Jack Ripper is assistant editor of the two publications.



The world's largest manufacturers of FUEL INJECTION EQUIPMENT



C.A.V. DIVISION OF LUCAS ELECTRICAL SERVICES INC., 653, TENTH AVENUE, NEW YORK, 19, M.Y. Sales Office: 14820 DETROIT AVENUE, CLEVELAND, 7, OHIO.



Fuel Injection and Electrical Equipment

John Beatty Named Man of Year



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John T. Beatty

John T. Beatty, president of United Specialties Co., Chicago, has been named management Man of the Year by the National Association of Foremen. A plaque and citation were presented during the group's recent 31st annual convention in Cincinnati.

The award, highest bestowed by the association, goes annually to the man who has "done the most outstanding job in America in practicing the NAF code of ethics in achieving success as a member of management." The recipient is selected by NAF's national board of governors, representing 61,000 members. Others who have won the honor include Mason M. Roberts, General Motors vice president, and Ralph S, Damon, TWA president. Mr. Beatty is a director of the National Labor-Management Foundation and Chicago Employers' Association.

Factory Manager



Kent R. Manning

The appointment of Kent R. Manning, 31, to the post of factory manager of Aeroquip Corporation, Jackson, Michigan, has been announced by Matthew J. Betley, vice president and general manager of Aeroquip. He will direct plant operations and the Methods & Standards,

Production Control and Purchasing departments. Prior to his appointment as chief development engineer of Aeroquip in January, 1952, he participated in development work on the guided missile program for the U. S. Army.

Dieselization Nears Completion

A program begun in 1947 to convert Missouri Pacific Lines from steam to diesel locomotion will reach its climax early in 1955 when 66 new dieselized units are delivered. The recent placing of an order totaling nearly \$11 million will complete dieselization of the entire railroad.

With receipt of the 66 new units, MoPac will have 873 diesel locomotives in its operations, compared with an ownership of only 104 at the beginning of 1947. All of the diesel units ordered for 1955 delivery can be used in either road service or in yards. They are of the type known in railroad parlance as "jeeps," a contraction of the "general purpose" designation.

All Missouri Pacific passenger trains and through freight trains have been dieselized for some time. Receipt of the 66 new units will make it possible for MoPac to use diesels on local freight trains, work trains and traveling switching and yard switching assignments. And the line also will have available the necessary number of spare locomotives required to protect special movements and to allow for "shopping" other power. For a time after the new units are delivered, Missouri Pacific will retain 45 steam units in operating condition

on a stand-by basis. Twenty-three of these will be available for freight or passenger service and 20 will be exclusively for freight service.

New Sales Organization Plan

Under a new national sales organization plan H. A. Dietrich has been named manager of the Chicago district of Burgess-Manning Co., manufacturer of industrial noise abating equipment according to President Ralph L. Leadbetter. Under the new plan company sales organization will consist of three primary districts—Chicago, New York and Dallas—with S. G. Paddock, manager of the Dallas division, directing and correlating the entire sales operation.

The new plan does not affect the architectural products division in Chicago, headed by Vice President Dudley W. Day, F. C. Duerr has been assigned to Chicago district sales. The Chicago district includes sales agencies in Detroit, St. Louis, Ames, Iowa, and other cities. The Dallas district comprises the Southwest and southern Far West, with F. K. Becker of Dallas as manager and H. L. Harris assisting in Dallas district sales. The company has sales agencies in Tulsa, Houston, New Orleans, Denver and Los Angeles.

W. A. Carroll, Jr., has been named district manager of the New York district which includes the Eastern states and the Pittsburgh sales territory. R. T. Oliver has been assigned to New York district sales.



LAKE EDWARD

LAKE TANKERS CORP.
NEW YORK CITY

This tanker is one of 65 duplicate vessels powered with Model V6 UNION DIESEL engines, 6 cylinders, 14" bore x 19" stroke, naturally aspirated, which continuously develops 560 horsepower at 325 revolutions per minute.

The UNION DIESEL ENGINE Co. 2121 DIESEL ST., OÁKLAND 6, CALIFORNIA, U.S.A.

European Diesel News

By Hamish Ferguson

DIESEL EDUCATION. Due to the very large number of diesels now being produced in England, and particularly in the smaller power range, as used for automotive purposes and generating sets, there seems to be some probability that there may develop a shortage of trained operators to handle the engines in service. With this in mind, the Chicago Vocational Training Corporation Ltd. well-known thoughout Canada and the United States, have formed an associate company known as Lawson Technical Trade Schools Ltd. with headquarters in London.

£5 MILLION ADMIRALTY ORDER. Mirrlees Bickerton & Day Ltd. Stockport, are nearing completion of eight contracts, to a total of more than £5 million, received from the Admiralty in 1950. The order is for the supply of 261 engines for use in propulsion and generating units for wooden coastal minesweepers with light alloy frames. The main contractors are John L. Thornycroft & Co. Ltd., Southampton. The main engines are Mirrlees JVSS 12, high-pressure turbo-charged 12-cylinder vee-type engines having a bore and stroke of 93¼ in. and 10½ in., and developing 1,250 bhp. at 750 rpm. with a bmep of 140.3 psi.

The generating sets each comprise a Mirrlees JV 8 naturally aspirated 8-cylinder vee-type engine hav-

ing similar bore and stroke, and developing 560 bhp. at 750 rpm, with a bmep. of 94.3 psi., coupled to a generator manufactured by the Brush Electrical Engineering Co. Ltd., Loughborough.

PERKINS MARINE DIESEL. F. Perkins Ltd., Peterborough, have introduced a new engine, the L4 (M), specifically designed for marine purposes. Having 4 cylinders with a bore and stroke of 4½ and 4¼ in. respectively, it develops 58 bhp. at 2,000 rpm. The engine can be supplied with a Parsons mechanical reverse-reduction gear or with an oil-operated reverse gear.

GAS-TURBINED MILITARY VEHICLES. The Fighting Vehicle Research and Development Establishment of the Ministry of Supply recently staged a demonstration of the British Army's latest vehicle eqiupment. The outstanding feature was the first appearance of a heavy-tracked vehicle propelled by a gas turbine, A Centurion tank chassis had been adopted for experimental purposes and the turbine installation was carried out by C. A. Parsons Ltd. of Newcastle-on-Tyne.

Alternators or dc. generators, as may be required, are supplied by the MasFarlane Engineering Co. Ltd., Cathcart, Glasgow, and the switchgear is supplied by Arrow Electric Switches Ltd., London.

DIESEL TRAIN UNITS. British Railways have placed orders with British United Traction Ltd., Leyland, Lancs., for 66 sets of power car equipment and 21 sets of trailer car equipment. Each set of power car units consists of control car and two 150 bhp. horizontal diesel engines mounted nose to nose under the centre of the car, each engine driving an axle trough a four-speed air-operated self-charging gearbox.

REINFORCED PLASTIC PIPING. Bowden (Engineers) Ltd., London, are universally known for their cable and wire mechanism. They now announce a new aid to industry in their range of Bowden-flex pipe units incorporating reinforced plastic tubing. Complete pipe units up to burst pressures in excess of 10,000 psi. are available for a wide variety of uses of which fuel delivery pipes should be of particular interest to diesel users. For conveying acid, gas, air or any type of fluid, an inner plastic tube is selected and reinforced with wire braiding to withstand the pressure required.



ROLLS-ROYCE GENERATOR SETS, Petbow Ltd., of Sandwich, Kent, in co-operation with Rolls-Royce Ltd., Derby, have introduced a new range of generating sets designed as complete self-contained units. Vulcan and Merlin are the names chosen for the sets, the Vulcan series being portable and fully weather-proofed, whereas the Merlin series are intended for stationary installation in power houses. The engines employed are the Rolls-Royce C6., NFL developing 128 bhp., and the pressure-charged C6. SFL giving 162 bhp., both running at 1,500 rpm.



General Sales Manager



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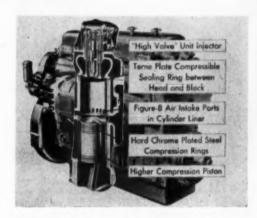
Wm. Clausen, executive vice president of General Metals Corporation and general manager of its Enterprise Engine and Machinery Division announced recently in San Francisco the appointment of Arthur W. Ostrander to the post of general sales manager of the Enterprise

Engine and Machinery Division, producers of heavy duty engines. Mr. Ostrander's appointment is an important part of the company's major expansion program which includes the introduction of new engine models in power capacities in excess of 5,000 horsepower, as well as a major increase in field sales and service personnel. He was formerly executive vice president of American Farm Machinery Company of Minneapolis, Minnesota. Prior to this he was vice president in charge of sales of the Farmhand Division of the Superior Separator Company at Hopkins, Minnesota. He is a graduate of Dartmouth College and holds a Master of Commercial Science degree from Amos Tuck School, Dartmouth University school of business administration.

Construction Boom Explained

A feature article in the new "Production Road" magazine recently released by Twin Disc Clutch Co., Racine, Wis., is "Construction, 1954: A \$36 Billion Boom, and Why." The story points up reasons why the proportion of expenditures on construction is rising faster than the gross national product and also draws comparisons in efficiency between major construction projects of today and yesterday. Copies of the magazine may be obtained by writing to the company.

Changes in Cylinder Assembly Announced



Improvements recently effected in the cylinder assembly of General Motors Series "71" diesel engines provide better fuel economy, increased horsepower in some sizes and longer life for these power plants in all types of industrial, construction and earthmoving equipment, according to GM. A bulletin issued to GM diesel distributors and dealers by the Detroit Diesel Engine Division states that these improvements and others previously announced complete an entirely new cylinder assembly for the Series "71" engine. The improvements are listed as a new cylinder liner which provides a freer flow of air into the cylinder, a new piston which increases the compression ratio and longer-life compression rings. The bulletin states the new liners and pistons are interchangeable with those formerly used and may be installed on engines now in service in any combination as replacements become necessary.

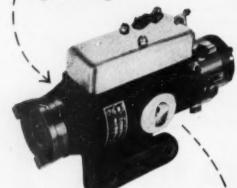
The new cylinder liner is characterized by air-intake ports which are "Figure-8" in shape. The openings are larger than those used in previous liners and their number has been increased. A 32 per cent increase in the air-intake area is thus provided for better all around cylinder scavenging and more complete combustion. Operating in conjunction with the new cylinder liner is a new, improved piston. Better cylinder scavenging and better combustion help reduce fuel consumption and increase horsepower. The compression rings now used are of hard chrome plated steel. They are tougher and more flexible than the rings formerly used and are capable of delivering many more hours of service.

An illustrated booklet, "The Inside Story," fully describing the completely new Series "71" is available from Detroit Diesel distributors and dealers or by contacting Detroit Diesel Engine Division. 13400 W. Outer Drive, Detroit 28, Michigan.



LUBER-FINER, INC., 2514 So. Grand Avenue, Los Angeles 7

this revolutionary pump



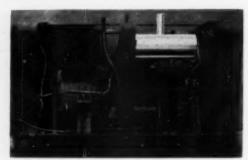
makes good diesels better!



Perfected after 15 years of research and intensive field experience, the Roosa Master is a revolutionary development for better and simplified fuel injection. Performance-proven . . . simple . . . compact and lightweight, Roosa Master offers to both diesel engine manufacturers and users such advanced features as: built-in governor that gives extremely close speed regulation, built-in transfer pump, complete selflubrication...plus the elimination of complicated springs, poppet valves, ball bearings and gears. Not limited on high speed applications and easy to service right in the field, Roosa Master pays big dividends (to your diesel customers) in high performance, low maintenance cost, and long life. For the very best in diesel engine performance, specify Roosa Master, made by one of New England's leading manufacturers of precision machined products. Complete information is available from the Hartford Machine Screw Company, Hartford 2, Conn., or your engine manufacturer.



New Silencer Eliminates Manifold



This Kittell silencer requires no manifold because the unit is mounted directly to the engine block.

A silencer which doubles as a manifold has been developed by Kittell Muffler and Engineering Co., 915 S. Santa Fe Ave., Los Angeles, Designed at the request of Salyers Equipment Co. of Los Angeles for use on a generator set powered by a DIX 6D Hercules engine, the new muffler is said to save weight and make possible a smaller, more compact generator set. No manifold is required because the silencer is mounted directly on the engine block by means of a flange.

The unit's interior features the same louvre design of standard Kittell silencers. As the exhaust bursts enter the chamber they are directed through louvres along the outer shell which cools them and reduces their volume. More louvres direct the gases back into the center of the sillencer and out into the atmosphere. The new silencer is made of stainless steel and is welded throughout. Additional information may be obtained by writing to the manufacturer.

Research Director Named



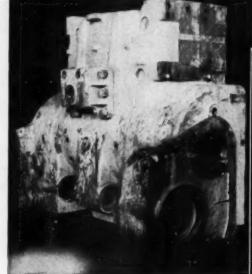
A. A. Batts, Jr.

The appointment of Arthur A. Batts, Jr., as director of market research for American Locomotive Co. has been announced by William F. Lewis, vice president-marketing. Mr. Batts, a graduate of Hamilton College and Harvard Graduate School of Business Administration.

comes to ALCO from the Carborundum Co., where he directed research for seven years.

In his new position Mr. Batts will conduct marketing surveys, suggest product opportunities, provide marketing and economic forecasts and make available various data on business activity. He will headquarter at Schenectady, N. Y. His appointment is in line with ALCO's creation of a strong marketing organization, necessitated by expansion into new fields.

BEFORE

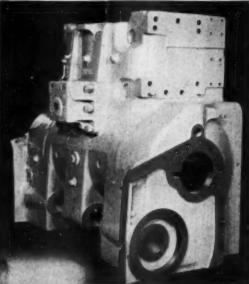


and AFTER

This apparently hopelessly broken DB transmission case left our shop after a few days in "as-new" condition and ready for another lifetime of work.

A valuable and important piece of equipment, as a consequence, was quickly placed back into service at a fraction of the part's replacement cost. Another example of GUTH-PASCOE restoration work.

All ferrous and many non-ferrous castings (alumi-



num included) can be restored at substantial savings by the GUTH FUSION PROCESS no matter how badly damaged. Size and complexity is no obstacle. Castings are returned to original specifications. It will pay you to investigate GUTH-PASCOE. On your next job, give GUTH-PASCOE the break!

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1933 East Washington Street • Phoenix, Ariz. • Phone Alpine 4-0391

EMERGENCY

rush service day or night . . . Sundays and Holidays included

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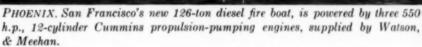
tion. Co.,

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Fire fighter fights engine wear, too

FIRES AND DIRTY OIL have this in common-Both are destructive and unnecessary. Care will prevent fires, and Purolator* Fuel and Lube filters will stop excessive engine wear caused by contaminated oil.

That's why the three 550 h.p. main propulsion and pumping Cummins diesels aboard the Phoenix are Purolator-protected. Purolator Micronic* Filters are the No. 1 choice of leading engine builders because they provide up to ten times the area of depth-type filters; stop particles sub-microns small; won't channel or unload; won't strip additives . . . yet permit high flow rates in minimum housing space.

Whatever your filtering problem, our Engineering Department can help you solve it! Write for the new Purolator Industrial Catalog—it details the many units in the line contains information about filtration equipment sure to meet your most exacting standards. *Reg. U. S. Pat. Off.



PUROLATOR PRODUCTS, INC., Rahway New Jersey, and Toronto, Ontario, Canada Factory Branch Offices: Chicago, Detroit, Los Angeles

Gulf Coast Diesel Notes

By Michael T. Pate

GULFPORT Shipbuilding Company, Port Arthur, Texas, has secured through series 71, General Motors diesels. The driven by a gasoline engine. 165-hp. inclined 6-cylinder engines will be used to power a yacht for the ship- GULF Oil Company, Pipe Line De- pany, Houston, a model D375 200 kw.

tating screws through 2:1 gears.

Sales & Service, Inc., Houston, a model 135 DKBS Waukesha diesel, which will

building company, driving opposite ro- partment, Houston, has bought through electric set. The Caterpillar engine will Stewart & Stevenson Services, Inc., of provide the stand-by power for the Houston, a General Motors series 71, 4-BURGESS Poultry Farms, Nacogdoches, cylinder inclined diesel rated at 110 hp. Texas, has bought through Waukesha The diesel will be used to power a 29foot Chris-craft boat for offshore work.

Mustang Tractor & Equipment Com-

:ompany's Almeda transmitting station.

C. G. GLASSCOCK Drilling Company. Corpus Christi. Texas, has bought through Stewart & Stevenson Services, Stewart & Stevenson Services, Inc., two be used to repower a truck formerly HOUSTON Consolidated Television Inc., a series 71, quad six General Mo-Company, Houston, has bought from tors diesel to power a National C-350 mud pump through conventional V-belt drive. The engine is rated at 520 continuous hp.

> PLATZER Boat Works, Houston, is installing for the Standard Oil Company of Texas a Bolinder-Munktell 3-cylinder diesel with power take-offs at both ends of the shaft. The diesel will be connected to two transfer pumps, the 40 hp. unit powering either pump as desired. The barge will also be equipped with a model 1054 Bolinder-Munktell diesel, where the 65 hp. engine will power a winch. Both diesels were bought through the American Bolinder-Munktell Company, Houston.

> PAN-AMERICAN Petroleum Company, Production Department, Houston, has secured through Stewart & Stevenson Services. Inc., two General Motors series 71, 4-cylinder inclined diesels, rated at 110 hp. The diesels will be used to power two 26-foot crew boats through 11/2:1 reversing and reduction gears.

PHILLIPS Petroleum €ompany, Houston, has bought through Mustang Tractor & Equipment Company, Houston, a Caterpillar D375 diesel for powering a drilling rig mud pump. The diesel is rated at 284 hp. at 1200 rpm.

THE WESTERN Company, Midland, Texas, has bought four General Motors series 110 diesels. The diesels will be used in pairs with Allison torque converters and Allison Torquatic transmissions to power two pumps for highpressure sand-frac service. The diesels are rated at 420 hp. each.

IOHN HAMMOND, Sabine, Texas, has bought from Mustang Tractor & Equipment Company, Houston, a Caterpillar model 311, 20 kw. electric set. This dieselized generating set will be used on a dredge, and is the second such set ordered by the Hammond interests.

PURE OIL Company, Houston, has bought a Stewart & Stevenson model 3GD 30 thirty-kw. ac. generating set powered by a 3-cylinder series 71 General Motors diesel. The set will furnish power for an offshore platform lighting

LIGHTHOUSE, INC., Houston, has bought through Buda Engine & Equipment Company? Houston, ten 2BD77, 15 hp. Buda engines to power the com-



- you to economize on production costs.
- ★ Junior Units attract attention . . . always will appear with editorial matter above and along one side of your ads.
- ★ Junior Units give you flexibility. Ten standard sizes lend themselves to any kind of presentation you may wish to make to our readers.

This ad, for example, is a full page—Junior Unit. Note that it dominates the page—the BIG page that permits DIESEL PROGRESS to make developments in the industry easily understood through dramatic use of illustrative material.

Drawings of two other of the Junior Units are reprinted here to indicate the flexibility they offer. Complete information and a Junior Unit rate card recently was mailed to advertisers and agencies. If you missed seeing these, refer to your media file or let us know. We'll send the circular and card pronto. They'll help you plan 1955 campaigns.

ISLAND HALF PAGE— JUNIOR UNIT

Plate size: vide, 10" deep

816 No. La Cienega Blvd.

IESEL PROGRES

Los Angeles 46, Calif.

pany's Automatic Navigational Aids, ager for the Dallas (Tex.) Branch, Re- The Welcoming Luncheon, and the an- release detailed plans in the near future. up five such sets, each being connected to compressor and electric generator and drives-used on powered equipment in the pattern of previous years, bringing Other members are W. A. Patterson, fully automatic so that the failure of any unit will cut in the stand-by portion of the equipment. This brings the marine and agriculture markets-Twin tional Installation Luncheon will be Kansas City, Kan., S. G. Marks, Marks

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DALEHITE Boat Service, Galveston, ford Illinois, Texas, has bought through Stewart & Stevenson Services, Inc., of Houston, a series 110, General Motors diesel which Chicago Convention in January they will use to drive their own boat through a 2:1 reverse reduction gear.

SHEFFIELD Steel Division, Houston, from every section of the United States has bought from Mustang Tractor & and Canada, will converge on Chicago Equipment Company, Houston, a model January 23-27, 1955, for the 36th An-D375, 200 kw. electric generating set powered by a Caterpillar diesel rated at Distributors, The convention will liter-284 hp. at 1200 rpm. The unit will be ally take over the world's largest hotel, used for emergency stand-by power.

CARDINAL Chemical Company, Odes- date concepts of distributor operation sa, Texas, has bought a General Motors and will review recent developments series 71, model 12103 twin six diesel to and progress in the construction equipdrive a sand-frac pump. The diesel is rated at 260 hp. It was secured through cially focused on advertising, sales plan-Stewart & Stevenson Services, Inc., of ning and industry relations. Another Houston.

Addresses Association

pany, recently spoke to the Eastern Pur-Railroads in Boston, Massachusetts on billion gallons per yer, according to Mr. manufacturer executives. Messick. He told the group: "With rising costs and reduced incomes for rail-

has tested over four millon gallons of both groups. The five-day program also fuels in a search for satisfactory low- allows ample time for distributors to cost diesel fuels. These fuels tests have schedule informal afternoon conferbeen made in Ashland Oil's own fleet ences with manufacturers, A.E.D.'s Genof dieselized towboats operating on the eral Advertising Committee will join Mississippi and Ohio Rivers.

tant sales manager, Hydraulic Division: Group Clinic-will bring together leadto manager, Export Sales; and Mr. E. H. exchange ideas and promote construc-Bennett has been appointed district man-tive and useful programs in 1955.

The diesels will be used in pairs to make cognized as one of the leading manufac- nual Birthday Party, which celebrates is headed by Cornelius Whetstone, Serturers of industrial friction and fluid A.E.D.'s 36th anniversary, will follow vice Supply Corp., Philadelphia, Pa. the construction, petroleum, manufac- members a variety of entertainment, Richards Equipment Co., Waco, Tex.; turing and processing, logging, mining, speeches and banqueting. The tradi- R. F. Newlin, Newlin Machinery Co., total of such Buda-powered units to 30. Disc Clutch Company has factories lo-held Jan. 26 when 1955 officers will take Tractor & Equipment Co., Cleveland, cated in both Racine, Wisc. and Rock- over their new posts, Events will close Ohio: and A. F. Sersanous, Loggers &

A.F.D. Announces Plans for

More than 2,000 construction equipment distributors and manufacturers, coming nual Meeting of Associated Equipment the Conrad Hilton, where, according to A.E.D., participants will discuss up-toment industry. Attention will be espemajor highlight will be the election of A.E.D. officers, for the coming year and the traditional installation ceremonies. Manufacturer-distributor meetings play Harold V. Messick, diesel research engi- an important part in convention plans. neer with Ashland Oil & Refining Com- A.E.D.'s recently-formed "Industry Round Table"-where manufacturers chases and Stores Regional Group Meet- and distributors discuss mutual probing of the Association of American lems-will be prominently spotlighted, showing delegates how the group is the subject: "A Supplier Looks at Low- working toward increased harmony with-Cost Diesel Fuels." Mr. Messick is tech- in the industry. The annually popular nical adviser to the National Accounts "Meet Your Manufacturer" session will Department of Ashland Oil. Since the be expanded in scope, with greater faend of World War II the use of railroad cilities than ever before for conferences diesel fuel has increased by over two between individual distributors and top

This year, for the first time in A.E.D. roads, management is pressing their oper-history, manufacturers will participate ating departments to explore every possi- in business sessions. This move, apbility of utilizing low-cost diesel fuels." plauded by manufacturers and distributors alike, is expected to enhance Mr. Messick reported that Ashland Oil greatly the value of these meetings to forces with a group of manufacturers' advertising managers to lead a number Sales Department Appointments of discussions on distributor advertising. Topics will be tailored to suit the needs Mr. N. F. Adamson, vice president- of advertising men in distributor or-Sales, of the Twin Disc Clutch Company, ganizations, and will include such sub-Racine, Wisc., has announced a number jects as direct mail, cooperative adverof sales department appointmens. Mr. tising, copywriting, layout and art work, R. C. McRoberts has been named assis- A special convention event-the Local Mr. J. B. Schubeler has been promoted ers of local distributor associations to

day, Jan. 27. The Committee, which will Oregon.

with a Farewell Luncheon on Thurs- Contractors Machinery Co., Portland,



INSTANT RESPONSE. STABLE ACTION

This new load sensing governor of extremely simple construction is designed to provide precise control and trouble free operation of all A.C. engine driven generators.

Applicable to any make or model diesel or gas engine, the DUPY instantaneously regulates frequency by controlling engine speed.

New design eliminates moving or wearing parts, making the DUPY practically maintenance-free. Units are easily adapted to any engine.

Write for DUPY Bulletin No. T-8500, which gives full performance characteristics and general specifications.

Because it is a LOAD SENSING GOVERNOR its performance is superior . . .

FAST RESPONSE upon application of full load governor will bring frequency back to regulating range in less than 1.5

CLOSE REGULATION ±1/4% no load to full load, or steady state.

STABLE OPERATION Minimum dip and

MAINTENANCE-FREE No wearing parts, ne commutators, no slip rings.

APPLICATIONS:

400 CYCLE POWER SUPPLIES 60 CYCLE POWER SUPPLIES MARINE AND SHIPBOARD POWER OIL FIELD POWER SUPPLIES RAILROAD ENGINE GENERATORS

RADIO AND TV STAND-BY TELEPHONE STAND-BY

AIRCRAFT GROUND POWER SUPPLIES



West Coast Diesel News

By James Joseph

10 F & J LOGGING CO., a 6DT-468 Buda diesel engine for work in the Sutherlin, Ore. area, through Portland's Hamilton Engine Sales, Inc.

A GM 4-71 DIESEL is being installed



"ON-THE-SPOT" POWER WHEN YOU NEED IT



E-M "Packaged" Generators supply constant voltage automatically . . . dependably

Simple, trouble-free, and dependable
...these E-M "packaged" units are
complete. Generator, exciter, control, and all necessary components are integrated into one compact housing, ready to install and easy to connect. And no special switchboards or operating skills required!

Built-in voltage regulators assure a steady output whether generators are operated singly or in parallel. When load varies, voltage output is quickly returned to desired level.



Sturdy E-M construction plus a minimum of moving parts gives you long service with only routine maintenance Ratings to 187 kva, in speeds of 900 to 1800 rpm. Ask your nearest E-M sales engineer for more facts, and write for publications listed below

ELECTRIC MACHINERY MFG. CO. MINNEAPOLIS 13, MINNESOTA

Send for these informative brochures: "The A-B-C's of 'Packaged' Generators" "The A-B-C's of Policy Control of Issue E-M Synchronizer No. 35, Generator Issue (2100-TPA-2147)

at Kernville, Ore. for Roy Stephens, ment Co., Berkeley, Cottage Grove, Ore.

TO MODERNIZE A LOGGING UNIT, Gold Beach, Ore,'s Anderson Brothers has purchased a GM 6-71.

KNAPPTON TOWBOAT CO. has taken delivery on two GM 6-110 marine engines to power newest tug in their fleet. Hull is being built by Gunderson Bros. Engineering Corp., who furnished the diesels.

GUNDERSON BROS. also reports sale of two 6-110 marine units to Smith Towing Co., Longview, Wash., for powering a new tug.

CALIFORNIA'S MALIBU Pier Corp. has purchased a GM 2061-A to power a 20 kw. ac. generator aboard their barge, moored off Santa Monica. Sale by Crofton Diesel Engine Co., Inc.

CALIFORNIA COTTON COMPRESS and Warehouse Co., Pinedale, Calif., has installed a GM 6-71 heat-exchanger cooled diesel engine, directly connected to a Worthington fire pump, rated 1500 gpm. at 100 psi.

FOR THE BADGER PASS (Calif.) Ski Resort, a 40 kw. GM diesel electric set, powered by a 4-71 radiator-cooled GM, and remotely controlled from pushbutton in resort's kitchen. The power plant will take on load of electric cooking (and some heavy day-time loads). A 15 kw. Kohler plant handles lighter nighttime lighting loads.

PALMER CONSTRUCTION CO., working with Peter Kiewitt & Sons, has purchased a 2-51 GM diesel to power a specially designed concrete truck operating inside a 9-ft. dia. tunnel. Truck is 30-ft. long and the 2-51 GM will drive an hydraulic model C103 Adel pump. rated 371/2 gpm. at 1000 psi. Hydraulic motor provides power to a jack shaft, which in turn powers rear driving wheels of the truck through a chain drive. Unit carries concrete grouting.

THROUGH West Coast Engine and Equipment Co. (Berkeley, Calif.), a GM 4-71 diesel to Branscomb, Calif.'s L. Guimelli, for cold decking logs at Mr. Guimelli's sawmill

WALTER JOHNSON CO, is building four dredges for the U.S. Corps of Enginers, each dredge installed with a GM 6-71 (to power 8-inch dredge pumps): a GM 2-71 (driving the cutter as well as powering hauling and hoisting winchdrives); a GM 2-71 (powering a 24-ft. dredge tender, included with each dredge). Dredges are 40-ft. long and are equiped with 8-inch suction pumps,

boat, St. Christopher, a GM 2-71 marine sel's scheduled for pleasure trip to diesel with 3:1 reduction gear. Manis- Costa Rica. It can cruise at 16 knots. calco is known as the "Crab King." New engine will give greater speed and TO SAN PEDRO TUGBOAT CO. for power for dangerous fishing operations re-powering its tug No. 24, a new GM near beaches

OAKLAND, CALIF.'s Judson Steel Co. has installed a GM 2-71 industrial diesel to power 20 kw. generator on its 25ton Industrial Brown Hoist magnetic crane. Same crane was recently repowered with a GM 4082 diesel torque unit and with a GM 2-71 driving the gener-

A 25-TON Industrial Brown Hoist railroad crane on Southern Pacific's lines has recently been equipped with a GM 4082 torque converter-equipped diesel. Crane operates betwen Oakland and

OREGON's RALPH CRUM has taken driven by a 6DAS-516 Buda enginethrough Hamilton Engine Sales. Inc.

INSTALLED IN Emerson Spear's Little Tramp, a new GM 4-71 with 3:1 hydraulic gear swinging a 36x27 Michigan propeller. Vessel operates out of Los

mariner, has purchased a 38 ft. molded ters in Lubbock, branch in Odessa.

in the new fishing boat now abuilding. Sale by West Coast Engine and Equip- plywood. Drake Craft Cabin Cruiser (completely fiberglassed) and powered by two GM 4-51s, using 21/2:1 reduc-FOR LORENZO MANISCALCO's crab tions and swinging 20x24 props. Ves-

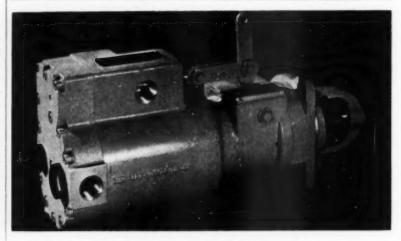
> quad with 6:1 reduction-through Crofton Diesel Engine Co., Inc.

FOR INSTALLATION ABOARD subchasers being built by South Coast Co. (Newport Beach, Calif.), six GM generator sets, model 2064-Bs.

CITY OF Long Beach (Calif.) has acator. Crane is now 100-per cent GM cepted two 60 ft. fireboats (built by Fellows & Stewart, Terminal Island). powered by GM 6-110s. Each vessel has twin screws (43x24) driven by a 6-110 through 3:1 reduction.

Appoints Texas Dealers

Appointment of three new dealers to handle sales and parts service in Texas has been announced by V. L. Snow, delivery on a TRD-14 Wagner Tractor Director of Sales, Euclid Division, General Motors Corporation. They include: In northeast Texas, Conley-Lott-Nichols Machinery Company, Dallas and Longview. In south Texas, Ingram Equipment Company with headquarters in San Antonio and branches in Houston, Corpus Christi, Edinburg and Austin. In west Texas east of the Pecos River and the Pan Handle, Conley-Lott-Nich-CECIL R. PARSONS, retired merchant ols Company of West Texas; headquar-



IIVADATAD HTDROTOK

A new, revolutionary cranking motor for diesel and gasoline engines, the Hydrotor provides efficient starting at all temperatures in all climates. Three sizes fit all needs for farm, industrial, marine and military applications. The

Hydrotor operates in a closed hydraulic system, independent of batteries. Cranking energy is easily restored to the accumulator by the hand

Write today for literature.

HYDRAMOTIVE, INC. 6723 Dennison Ave. Cleveland 2. Ohio



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Three new electric generating plants built especially for magnet service in Bulletin scrap yards, large industrial plants and Model 10CW-150R is a remote starting volts, dc. Prime mover for this new magnet generator is the Onon opposed 2cylinder, air-cooled "CW" engine which utilizes an exclusive "vacuum cooling" system by which all heated air is expelled at one small vent which also discharges engine exhaust. Extremely compact for its horsepower rating (21.0 at 1960 rpm.) the heavy-duty, 4-cycle engine weighs only 800 pounds; is 39-in. long, 27 9/16-in. wide and 28-in. high, making it ideal for crowded installation

The Onan-built magnet service generator (with drooping voltage characteristic) is direct connected to the engine. is of drip-proof design, will deliver 230 to 250-volt output (with rheostat control) and is cooled by the engine blower. Two new water-cooled engine driven magnet service generating plants are offered in 10,000 and 15,000 watt sizes.

Plant to Streamline Production

Future plans for Cleveland's Towmotor Corp., manufacturers of fork lift trucks, are being centered around a new plant designed to streamline production facilities, according to an announcement by C. Edgar Smith, president. Towmotor's plant will make space available in existing buildings for expanding research, development activities and centralizing. In line with the corporation's plans for expansion is an announcement that Towmotor is featuring a new "Cushioned-Power" diesel, for which the firm claims exceptional power.

Filter for Cooling System

Detroit Diesel Engine Division of General Motors has announced the availability of a new engine water filter as an optional accessory on Series "51," "71" and 6-110 diesel engines. Through the use of mechanical filtration, inhibitors and resistor plates the filter removes impurities from the cooling system, softens the cooling water and controls alkalinity, rust formation and electrochemical action. The unit contains a replaceable filter element which is to be renewed at regular intervals depending upon the chemical composition of the cooling water. In the event the element becomes clogged, water by-passes the filter and no filtering action takes place until the element is replaced. The filters

to 71/2-in, in height.

for original equipment manufacturers Publication of a new 12-page bulletin ping. Bulletin 235 points up the savings have been announced by D. W. Onan describing Nordberg 29-in. bore station- that may accrue from the use of straight Photographs and cross sectional draw-& Sons Inc., Minneapolis, Minnesota. ary and marine diesel engines which run or cracked residual fuels. The Type ings show the rugged construction of range in size from 4500 to 10,800 hp. is TS-29 engine operating as a Duafuel this series of Nordberg engines. Bulletin unit with a rating of 40 amps. at 250 announced by Nordberg Manufacturing unit permits even greater savings where 235 is available upon request to the Company, Milwaukee 1, Wisconsin. gas is abundantly available and inex-company.

New Magnet Generator Models in. to 5-in. in diameter and from 6-in. Bulletin 235 shows these engines in pensive. This economy of operation of gaged in coastwise and worldwide ship- large capacity.

stalled in municipal central power sta- Nordberg Type TS-29 engines should be tions, public utilities, industrial plants of special interest to all power users and in tankers and cargo vessels en- whose requirements demand units of



By David I. Day

UPPER OHIO RIVER floods, an off- ant engineer. shoot of Hurricane Hazel, forced 3000

time. She has a fine engine room, with oil, two of gasoline. twin Fairbanks-Morse engines. Chief is P. C. Crumrin with Robert Hill as assist-

persons to evacuate Wheeling, West Va., WE WERE VERY MUCH PLEASED noted river port. Ed Vickers mailed to see the veteran Paul Blazer of the flood pictures, including one of the Ashland Oil fleet, built a dozen years Claude Tully of the Patton-Tully Co., ago, at Calumet yards, Chicago. Using Memphis, Tenn. The Tully was making 2000 hp. Superior engines, she was

RILEY HURLEY, chief engineer of the L. Wade Childress, of the Mississippi Valley Barge Line, is making quite a name for himself and the fine Dravobuilt towboat. Several times the boat has pushed up to 26 or 27 barges of steel, more than 20,000 tons. J. E. Blackman is the assistant and a fine one. The Childress is rated at 3000 hp. with twin General Motors engines.

WE THOUGHT WE COUNTED 29 barges in front of the Childress not long ago. Sighted her on the Mississippi 40 miles above Greenville, Miss. Passing nearby was the fast, popular Harry Truman of the Federal Barge Lines with Chief Will Cummings and Assistant Engineer Charlie Wassner in charge. The Truman is General Motors powered (3200 hp), and was built in 1948 at the Avondale yard near New Orleans.

COMPLIMENTS to Engineers W. P. Guillot and K. R. Zenos of the 800 hp. Zeus. Of the Sabine Transportation fleet, Port Arthur, Texas, she is always active on the lower Mississippi and the canals. She uses a single Cooper-Bessemer engine. This boat came from the Nashville yard in 1943 and runs like new. At one time, she was the Emory T. operated by Clark's Super Gas Co., Mil-

ANOTHER FAITHFUL OIL BOAT noted near New Orleans was the Frank B. Durant. She has General Motors engines, and is owned by the Oil Transport Co. She was northbound with Using a combination of two newly devel-Chief D. A. Schmidt and Assistant En- oped interchangeable impellers, the Sergineer Doyle Simpkins on board.

WE MUST MENTION here two nice small towboats already at work. They considerably. The units are self-adapting are the Yankeetown and Clifty Creek. Both were built at the Barbour yard, Lemay, Mo., the former for the Mid- city. This series is of the same basic Continent Barge Line, the latter for Indiana-Kentucky Electric Corp. Both are G-M powered, the former 1800 hp., the latter possibly a little less.

THE TWIN CITIES of the Lake Tankers fleet is now working on the Missouri River. She is very popular in the oil trade there. Built at St. Louis Ship in 1940, she is running smoothly with her twin Fairbanks-Morse engines, totaling approximately 1400 hp.

MRS. C. L. NORMAN, Kansas City, reported recently the comparatively new Sioux City was headed up the Missouri with a miscellaneous tow from Ohio River ports. The boat was built last year and uses twin G-M engines, 1800 hp.

Inland River Reports her first upper Ohio jaunt in a long pushing a dozen loaded barges, ten of THE LITTLE but very attractive Harper C. Patton has been completed at Bowling Green, Ky., for the Hines Transportation Co. A phone report says "twin G-Ms." We hope to see the boat in November or December. (Sorry to report also that Harper C. Patton, president of Streett Towing Co., St. Louis, for whom she is named died Oct. 7.) 141111111111

> THE TRIPLE-SCREW Mount Vernon is doing good work on the Mississippi, mainly in the grain trade. The vessel uses Cooper-Bessemers, 2100 hp., and is in the Fleet Towing Co.'s possession. We recall well her early and very successful work trips in 1951 after completion by Jeffersonville Boat & Machine.

> THE CASTEEL of the Oil Transport fleet pushed several tows up the upper Mississippi last fall Each tow consisted of 59,000 barrels of crude or more, and the boat made around seven miles an hour in open water. She has Fairbanks-Morse twins, 3600 hp., and was built in 1952 at the F. B. Walker yard, Pascagoula, Miss. We congratulate Chief Engineer Lionel Broussard on the Casteel's performance.

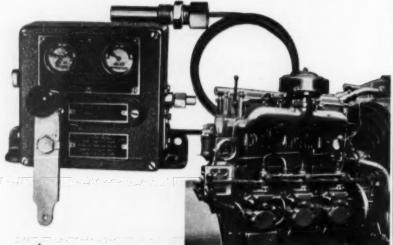
Centrifugal Blower

The development of a new multistage, standard production centrifugal blower with extreme adaptability has been announced by the Air Appliance Division, U. S. Hoffman Machinery Corporation, 105 Fourth Avenue, New York, The #385 frame unit is capable of delivering air volumes between 1,500 and 5,000 cfm. with pressures ranging from 1 to 9 lbs. gage, or vacuum from 2 to 12 inches Hg. ies 385 blower can be factory assembled to meet the individual needs of customers, cutting delivery time and cost to any variation in air volume requirements from minimum to maximum capadesign as the conventional Hoffman

District Sales Manager

Richard K. McCoy of Washington, D. C., has been appointed southern district sales manager for American Locomotive Co., according to W. F. Lewis, vice president-marketing. Mr. McCoy will headquarter in Alco's Washington office and will be responsible for sales of the company's commercial products in southern and southeastern states. Col. W. G. Lockwood, who represented Alco in Washington for 35 years, retired Oct. 1. He will be available as a consultant, but will make his home in Florida.

THE NEW NON-ELECTRIC TEDDINGTON NON-ELECTRIC "Engine Watcher"



Automatically stops the engine if dangerous conditions are reached, and tells you why!

Protects engines used on applications such as air compressors, pumping sets, small yachts, fishing boats etc., and many other applications where an electric supply is not available.

This new Teddington Non-electric Type OV unit continuously protects diesel engines which can now be left unattended for long periods without any risk of the engine being damaged by lubricating oil failure or excessive cooling water temperature.

The Teddington Non-electric Type OV

- Simplicity itself.
- Inexpensive-you can't afford not to have it.
- Gives visual indication of fault.
- Has automatic hold-out starting sequence.

FOR AUTOMATIC ENGINE PROTECTION CONSULT

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Teddington Protection Devices are used by the vast majority of British engine builders.

Nordberg Adds Gas Engine

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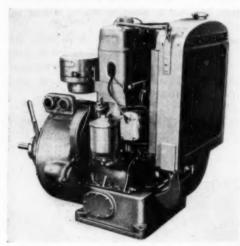
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Nordberg Power Chief single cylinder spark-fired gas engine.

A one-cylinder gas engine has been added to its Power Chief series of small diesel prime movers by Nordberg Manufacturing Co., Milwaukee. The engine is designed as a low-cost, meduim speed unit for oil field service and other small power application. It supplements Nordberg's 10 to 45 hp. Power Chief diesel engines of one, two and three cylinders.

The new engine is rated at from 9 to 18 maximum bhp, within an operating speed range of 800 to 1800 rpm. It has a 4½-in, bore and 5¼-in, stroke and is an extra heavy duty vertical, spark ignition

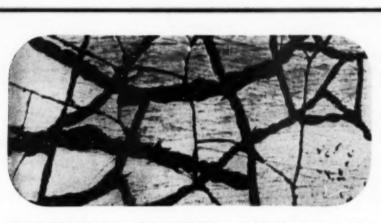
4-cycle engine. It is available as a complete, self-contained, ready to operate unit with clutch power take-off and as a "packaged" generator set producing up to 10 kw. Major parts of Power Chief gas and diesel engines are identical, permitting conversion of one to the other at reasonable cost. Nordberg points out.

Diesels Expedite Shipments



To expedite shipment of Hawaiian Punch concentrate to their mid-west canning plants, Pacific Citrus Products Co., Fullerton, California, this week added a third heavy-duty diesel truck and trailer unit making weekly round trips to Plymouth, Indiana, Grimes, Iowa and Collinsville, in Illinois.

Paul Hughes, President of Pacific Citrus, shown above, smiles with justifiable pride as he closes the cab door at the start of the truck's initial run from Fullerton, International tractors with 200 hp. Cummins diesel engines, and stainless-steel Trailmobile trailers comprise these efficient rigs.



CHANNELCROMIUM, illustrated above at 50 diameters to distinguish this process from all others, seats piston rings in not more than two hours to full directed control over the rate of lubricating oil consumption. The liner photographed showed no measurable wear after 240,000 miles (5,100 hours) in a diesel-electric main line locomotive.

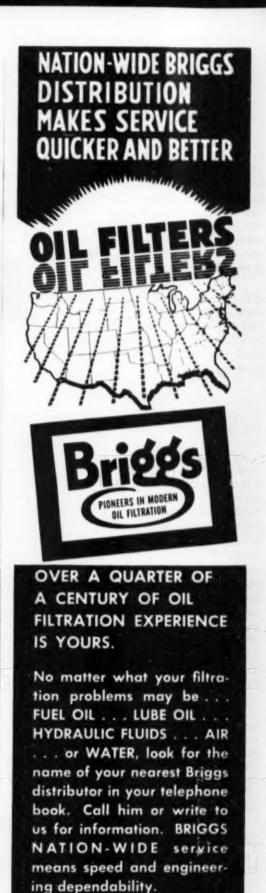
The cost of processing your used liners with CHANNELCRO-MIUM, ready for reinstallation in diesel-electric locomotives, is less than the cost of a new set with bare iron bores.

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THE BRIGGS FILTRATION COMPANY, RIVER ROAD

WASHINGTON 16, D. C.

New Orleans Diesel News

By James W. Calvert

SHELL OIL Company of New Orleans has just added to Rig 10 a Waukesha WAKDBS turbocharged diesel engine to drive a mud mixing pump. Waukesha has incorporated aluminum pistons and counterbalanced crank shaft for this high speed turbo operation. Maximum horsepower is 325 hp. at 1800 rpm. The unit was sold and installed by Reagan Equipment Company.

A WAUKESHA 135 ABS 185 hp. turbocharged diesel engine has been installed by Reagan Equipment Company in a 50-ft, steel crew boat owned and operated by Rufus Romero of New Or-

REBEL SEAFOOD Company has a new Wolverine W 1197 (Waukesha WA1D) 240 hp. diesel engine in its new 67-ft. fishing vessel Rebel. The engine was installed by Reagan Equipment Company of New Orlcans, Julius Angeron, operator of the vessel, who has been shrimping off the coast of Texas in the new trawler, reported that he had been trawling at 1000 rpm. and cruising at 1400 rpm., with ample horsepower for both operations.

JESSIE LEVY of the Caravan Towing Company of Harvey, La. has repowered his tug Charles H with a GM 6-110 diesel engine model 6-2203, rated at 275 hp. The engine was installed by George En-

VINCENT ROBBIN III of Harvey, La., one of the largest crew boat operators in the Louisiana oil tidelands scene, has taken delivery of a 50 ft. twin screw Sewart Seacraft crew boat from George Engine Co., Harvey. The boat, Miss Marion, now carrying oil field crews to offshore locations, is powered with two 6-110 series GM diesel engines rated at 285 shaft hp.

THE ALL purpose oil field workboat Jerry, the first of its class to be certified by the U. S. Coast Guard in the Louisiana tidelands area, was delivered recently by George Engine Co. to Arthur Levy of Berwick, La. The workboat, built to the customer's specifications by Sewart Seacraft, is all steel construction 80 by 21 by 61/2 ft., and is powered with twin 6-110 series GM diesel engines rated at 300 hp. each. The vessel has a cruising speed of 12 mph. Generator sets are GM 2-71 diesel engines. Jerry is capable of carrying both passengers and freight to deep sea oil locations in the tidelands.

C. & J. BOAT Co. of St. Martinville, popular Grand Isle fishing boat oper- gines, model DMG-36, rated 695 hp. at La., has purchased a Sewart Seacraft ator. The conversion was made by 450 rpm. The tug is 100 by 25 ft. and is crew boat powered by George Engine George Engine Company, Harvey, be- used in building offshore drilling rigs. Co. of Harvey with two GM diesel en- fore Mr. Brown left for Miami fishing gines model 407-1F. They are rated at grounds. The new engines weigh only THE MENHADEN fishing seiner Moss 1,910 pounds each.

TWO NEW GM inclined diesel engines THE OFFSHORE tug R. Thomas Mc- with an Enterprise diesel engine model 4087 and 4088, rated at 138 hp. each, Dermott, owned by J. Ray McDermott DMG-16, rated at 500 hp. have been installed in the fishing cruis- & Co., Inc., has been repowered with

Point, owned by Standard Fishing Co. of Moss Point, Miss., has been repowered

er Sea Hawk, owned by Jack Brown, two Enterprise turbocharged diesel en- ENTERPRISE Engine and Machinery

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Your competitor will use enough space in this "Bible of the Industry" to illustrate and detail fully all his products and models. Don't give him an edge by restricting your own section and number of pages in this new DIESEL CONSOLIDATED CATA-LOG, Volume 20.

Co., New Orleans, has installed a new New Horsepower Ratings 500 hp. Enterprise diesel engine model DMG-16 in Standard Fishing Com- New power ratings reflecting increases Moss Point, Miss

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pany's fishing boat Ocean Springs, now of from 7 to 24 hp. feature General operating in the Gulf of Mexico out of Motors marine diesels on display at the kw. generating unit has been sold to the both Series "71" and "110" models an- ing at 2100 rpm. city of Minden, La. for the municipal nounced by GM's Detroit Diesel Engine Division in 1954. Prominent in Detroit With head and block tilted 70° off ver-

affording higher compression and freer installed in craft as small as 28 feet. 1955 National Motor Boat Show in New engine breathing, these engines now York. The increases are due to design have a rating of 151 'n. each at 2300 A 3500-HP. Fairbanks-Morse diesel 2500 changes in the cylinder assemblies of rpm. in place of the erer 138 hp. rat-

Diesel's display is a matched pair of the tical and a generous use of aluminum comparatively new four-cylinder in- alloys these inclined diesels are lower clined Diesels of the "71" series. Equip- and lighter than the corresponding Serped with new pistons and cylinder liners ies "71" vertical models and have been

> Other engines featured this year are a Series "71" six-cylinder diesel for yachts and workboats, a six-cylinder "6-110" model with front power take-off, the "4-51" small-boat diesel and a 20 kw. auxiliary generator. The latter is driven by a two-cylinder Series "71" diesel.

> Contributing to better cooling and longer engine life on this year's models is a new engine water filter of the "by-pass" type. This provides mechanical filtration and also softens the water, controls alkalinity and inhibits rust and electrochemical action

National Fuels and Lubricants Meeting

Diesel and gasoline engine operating problems related to lubricants and fuels were considered at the SAE National Fuels and Lubricants Meeting held November 4 and 5 at the Mayo in Tulsa, Okla. The meeting was sponsored by SAE Fuels and Lubricants Activity with the co-operation of SAE Mid-Continent Section. L. A. McReynolds of Phillips Petroleum Co. was general chairman.

The opening session was concerned with lubrication problems of railroad diesel engines. Among the session chairmen were W. K. Simpson, Electro-Motive Division; D. R. Frey, Deep Rock Oil Corp.; M. M. Roensch, Chevrolet Motor Division; and J. E. Taylor, Gulf Oil Corporation.

Executive Engineer

Mr. L. E. Hammer, works manager at Worthington Corporation's Wellsville, New York plant, recently announced the appointment of Joseph B. Inferrera as executive engineer with headquarters at Wellsville. Mr. Inferrera was formerly chief mechanical design engineer.

Born in Messina, Italy, Mr. Inferrera holds an Industrial Engineering Degree from the Instituto Tecnico Industriale there, and here in the United States he attended classes at Massachusetts Institute of Technology for about two years.

He joined Worthington in 1937 as a turbine design engineer and served successively as chief draftsman and then mechanical design engineer prior to being named chief mechanical design engineer in 1947. Before joining Worthington, he had been associated with the Crittenden Mfg. Co., General Electric Co., and the B. F. Sturtevant Co., now a Division of Westinghouse Corp

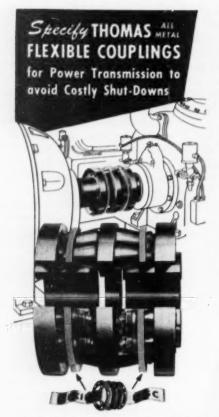


DATED CATALOG

THE CLOSING DATE is closer than you realize. All catalog pages for Volume 20 must be ready to print March 15, 1955. Publishing date will be June 15, 1955. No copies will be available until the date of publication. Write now for complete information. Published by:

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President of DEMA



Thomas E. Hughes

At the annual meeting of the Diesel Engin. Manufacturers, held in November in Chicago, Thomas E. Hughes, general manager of the Cleveland Diesel Engine Division, General Motors Corporation, Cleveland, Ohio, was elected president for the calendar year of 1955, Mr. Hughes, a native of Beaver Falls, Pennsylvania, graduated from the University of Illinois in 1932, and joined Cleveland Diesel Engine Division of General Motors in 1933 where he worked as a test engineer until 1935. In 1936, he was transferred to the engineering department. In 1937-38 he was engaged in service engineering work on the development of the diesel engine railroad business in connection with Electro-Motive and the central engineering group in Detroit. Later in 1938, he was transferred to the West Coast in the capacity of service engineering representative for the Cleveland Diesel Engine Division in connection with the United States Naval submarine program being carried on at San Diego and Mare Island Navy Yard in California. In 1939 Mr. Hughes was transferred to Washington, D.C. as assistant manager of the Cleveland Diesel Washington office, and in January 1941 he was made manager of that office, remaining there throughout the war years handling government sales. In September 1946 he was transferred to Cleveland as general sales manager, in October 1951 was made assistant general manager and in January 1953, he was named general manager of the Cleveland Diesel Engine Division of General Motors Corp.

Other officers elected in Chicago were: vice presidents: Wm. E. Butts, General Metals Corporation; Walter A. Rentschler, Baldwin-Lima-Hamilton Corp. Hamilton Division; treasurer: Robert H. Morse, Jr., Fairbanks, Morse & Co.; secretary and executive director: Harvey T. Hill, 1 North La-Salle Street, Chicago 2, Illinois.

The following directors were elected to serve for a period of two years—1955 and 1956: William E. Butts, General Metals Corporation; Guy J. Coffey, Chicago Pneumatic Tool Company; Otto H. Fischer, Union Diesel Engine Co.; Robert E. Friend, Nordberg Manufacturing Co.; Gordon Lefebvre, The Cooper-Bessemer Corp. The following directors were elected a year ago to serve for two years—1955 and 1956—and will, therefore, be on the

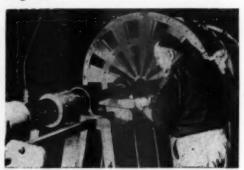
DEMA Board during 1955: C. Paul Clark, Clark Bros. Co.; M. C. Davison, Ingersoll-Rand Company; Thomas E. Hughes, Cleveland Diesel Engine Division, General Motors Corporation; A. W. Mc-Kinney, The National Supply Company; Robert H. Morse, Jr., Fairbanks, Morse & Co.; Walter A. Rentschler, Baldwin-Lima-Hamilton Corp., Hamilton Division; E. J. Schwanhausser, Worthington Corporation.

New Booklet Offered

A new booklet describing the KIM Hotstart, an electric pre-heater for diesel and gas engines, is available from the KIM Hotstart Manufacturing Co., W. 917 Broadway, Spokane 1, Wash. The device plugs into any electrical outlet and through a percolator-like action keeps the engine ready for instant starting even when vehicles are stored outside in below-zero weather, according to the manufacturer. Principal users are fleet owners in transportation and construction.

Typical installations are shown in the new booklet and specifications are listed for various sizes and types of engines. Copies of the booklet may be obtained by writing to the firm.

Solution of Problems in Air Cooling of Engines



Power to drive the main fan shaft of an engine is transmitted from a variable speed electric motor to a jack shaft. A Baldwin-Lima-Hamilton SR-4 torque pick-up (left) couples the jack shaft with the main shaft. Adjustable air exhaust vents provide one means of varying test conditions. Exhaust end of the wind tunnel is on the far end of the engine.

The effects of changes in engine-cooling fan design and in cooling air flow distribution on the power requirements for cooling an engine were almost impossible to measure when only dynamometers of older conventional types were available. When a more sensitive instrument became available, Dean & Benson Research engineers found it practical to make refinements in their test methods through installation of a wind tunnel in their Clifton, N. J., laboratories as a means of simulating the air flows obtained at different speeds of aircraft in flight. For testing the efficiency of fan cooling for aircraft and military tank engines, the laboratory now has a simple test set-up. A baffled engine complete with cowling, carburetor air scoop, and oil coolers is installed within a test coil which can be connected on the end of a wind tunnel duct. In many of these tests a cooling fan is mounted on a test shaft which takes the place of the engine propeller shaft and is motordriven at variable speeds up to 3000 rpm. The power to supply the required volume of air is measured by means of a Baldwin-Lima-Hamilton SR-4 Torquemeter with torque pick-up coupled between the jack shaft drive and the main shaft.



Exceptional durability and trouble-free per-formance has been achieved by new con-cept of design—the use of a free-moving ball as the seating element. Ball is seated gas-tight by force of engine pressure when valve is closed, and forced off its seat by valve spindle to open valve.

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MEMO TO: BUYERS

(Of Engines, Components, Accessories and Services)

You will have in your office after June 15, 1955-without cost to you—a catalog covering in one volume the products of the diesel industry. Based on experience gained in publishing 19 editions of Diesel Engine Catalog, we have redesigned the forthcoming DIESEL CON-SOLIDATED CATALOG so that it will be even more convenient and valuable to you. For example:

It will be solely and specifically a catalog, a composite catalog. It will be compact and easy to use for reference, and will be well indexed.

2. Our new format utilizes standard-size catalog pages. It will fit more comfortably into shelves and should prove to be easier to handle. The page size will be 81/4 x 11 inches.

3. Manufacturers of diesel, gas, and dual-fuel engines will list their models—showing dimensions, specifications, power curves, charts and cutaway drawings. These will greatly assist you in conferring with engineers and operating men before

writing your orders.
4. Besides the engine section, suppliers to the engine companies also will catalog the accessories, components and services they offer.

5. Finally, there will be the popular and widely-used "Market Place" listings where you will be able to find, quickly, those who supply the industry with everything from "Abrasives" through "Torque Converters" to "Wrist Pin Bearings." Available next June.

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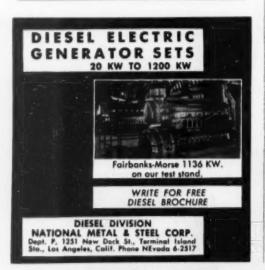
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Mid-Continent Diesel News

By Jack F. Cozier

EARL WAKEFIELD Drilling Co., Wichita, Kansas, has purchased two model 124 Murphy diesels, compounded on an Alamo chain case, for repowering a Wilson giant draw-works. Engine clutches are Wichita, air-tube type units. The "twin Murphy" unit will make available 450 hp. during the hoisting cycles for the rig now operating in Cowley county, Kansas. The transaction was handled by Murphy's Kansas dealer, Manufacturers Distributing Co., Great Bend, Kansas.

BUDA ENGINE & Equipment Co., Tulsa, Oklahoma, reports the sale of six DAS-844 Buda supercharged diesel engines for export to Mexico.

MID-STATES Construction Co., Tulsa, Oklahoma, has purchased a 614 Unit backhoe powered with a 2-71 GM diesel engine for pipeline work.

DR. BILL CHANDLER, Broken Arrow, Oklahoma, has purchased IND-24A V-8 Chrysler gas engine from the Diesel Power Co., Tulsa, Oklahoma, for irrigating 80 acres.

CLARK BROS. CO., Tulsa, Oklahoma, has just moved into their new office and warehouse at 1354 S. Sheridan.

WEST TEXAS has just received ten 6MO-970 Buda gas engines from the Buda Engine and Equipment Co., Tulsa, Oklahoma, for irrigation work.

H. H. HOWELL, drilling contractor and oil operator of San Antonio, Texas, is using on one of his rigs six HRI-600 Cummins diesel engines and two NHRIS-600 Cummins diesel engines.

FRED M. STOWELL Construction Co., Tulsa, Oklahoma, recently selected a model 20 Murphy diesel unit for their new Northwest model 6 dragline. The Murphy powered excavator is now on the job for the Muskogee, Oklahoma, city waterflow line project.

Irrigation work in Kansas has just received four 8MO-1290 Buda gas engines from the Buda Engine & Equipment Co., Tulsa, Oklahoma.

TEXAS Consolidated Transport Co. has just added two new Kenworth CBE (cab beside engine) trucks both powered with 180 hp. Cummins HRBB diesel engines.

BAGBY-HARRIS Sand Co., Tulsa, Oklahoma, just bought an Oliver 77 diesel wheel tractor for sand pit use. The tractor is equipped with a Maine Steel straight-line loader.

P. E. PRICE, Claremore, Oklahoma, has just purchased an IND-24A V-8 Chrysler gas engine for irrigation of 80 acres. The unit was purchased from the Diesel Power Co., Tulsa, Oklahoma.

H. A. HANE Construction Co., Garnett, Kansas, has purchased a Unit 614 backhoe powered with a GM 2-71 diesel engine from the Mid-Western Engine and Equipment Co., Tulsa, Oklahoma. The Unit will be used for pipeline work.

BUDA ENGINE & Equipment Co., Tulsa, Oklahoma, has sent out two 8MO-1290 Buda portable gas compressors. These versatile units are to be used for boosting natural gas from fields to gas lines, aiding in gas lift operations around oil wells and many other uses.

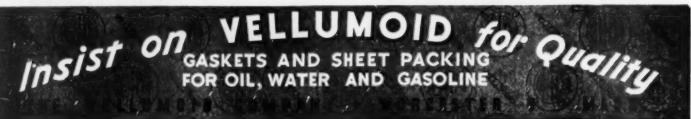
W. E. LOGAN & Sons, Muskogee, Oklahoma, are using a 780D Northwest dragline powered with a ME-6 Murphy diesel engine on the new Muskogee city water-flow line project.

Service Award

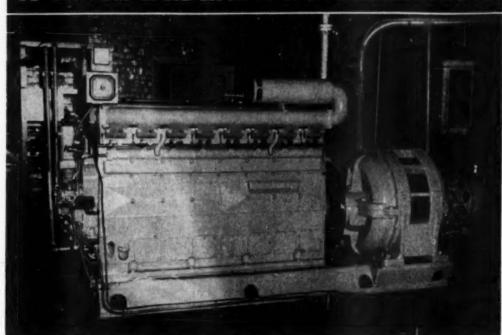


Presentation of a gold watch and service pin to Jules P. Kovacs, left, Vice-President in Charge of Engineering, Purolator Products, Inc., is made at Rahway, N. J., by President Ralph R. Layte to mark the completion by Mr. Kovacs of a quarter century of service with the oil filter company





A CIVIL DEFENSE INSTALLATION



PREPARED for hurricanes and other emergencies is the Miami plant of the Columbia Baking Co. The recently installed model 8-233-A General Motors diesel engine is able to take care of most of the needs of the bakery. The installation also included a 135 kw. General Electric generator and a 3 kw. GE exciter, a Woodward government.

ernor and a Maxim silencer completed this fine job. Mr. Bill Wix, the engineer for the Columbia Baking Co., said he plans to use the unit to reduce his demand rate during the critical periods in the winter months and in that way the unit will pay for itself in a very short time. Installation was made by the Peninsular Armature Works.

Sales Vice President Named



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J. E. Heuser

Jack E. Heuser has been appointed vice president in charge of sales for the Le Roi Co. of Milwaukee, a subsidiary of Westinghouse Air Brake Co., according to President T. O. Liebscher. Mr. Heuser will be responsible for the organization and management of a newly created

sales division. An engineering graduate of the University of Wisconsin, Mr. Heuser joined the firm in 1939. He formerly was sales manager of the engine division.

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Flash!

The diesel industry passed another great milestone November 19th when Joanne Wadman arrived in Evanston, Illinois. The first statement of the eight-pound girl was interpreted by her grandfather, Rex W. Wadman, to be "Stop the press!" The father is Bruce Wadman, Mid-West editor of DIESEL PROGRESS.

New Line of Pneumatic Valves

A line of solenoid operated shutoff and selector valves for aircraft, guided missiles and industrial applications is announced with the entry of Mar Vista Engineering Co. into the pneumatic valve field. The firm's address is 5420 West 104th St., Los Angeles 45.





Small Diesels



WITTE VERTICAL ENGINES

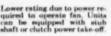
MODELS	CONT. H.P.	ECOLING	MAX. RPM
"ADTS"	4.0	Tank	1200
"ADRS"	3.75°	Radiato)	1200
"LDIS"	9	Tank	1350
"LORS"	8.6*	Radiator	1350

MODEL "AD

*Lower rating due to power required to operate fan. Units can be equipped with stub shaft or clutch power take-off.

WITTE HORIZONTAL ENGINES

MODELS	CONT.	COOLING	MAX.
"BDTS"		Tank	900
"BORC"	7.8*	Condenser	900
"CDTS"	12.5	Tank	750
"CDRS"	12.2*	Condenser	750





MODEL "BDRC

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LARGE DISCOUNTS OFF LIST



By Ed Dennis

trawler Islamorada powered with a D-13000 Caterpillar diesel and Snow Nabstedt reverse and reduction gears. A Hallett diesel is used for the refrigeration system; at the yards of Miami Shipbuilding Co.

with two model 6-110 General Motors Service at Fort Lauderdale.

pointed the South Florida distributor of Onan diesel plants and generators.

Florida Diesel News THE Chimeria, a 70 ft. yacht owned by AUTO MARINE Engineers of Miami built by Shrimp Boat Builders, Inc. of A. E. Archbold of N.Y., was repowered packaged the newly launched shrimp Jacksonville. Main propulsion is a model trawler Godeca, powered with a D. I. D337 Caterpillar. diesels, 1.5:1 reduction gears and GM X. E. C. Hercules diesel rated at 115 FOR PAKISTAN, the 65 ft. fishing hydraulic clutch by Ellis Diesel Sales & hp. and a Paragon 2.3:1 reduction-re- THE CARMELINA GRASSO, a newly verse gears, to be used in Cuban waters.

> R. B. GROVE Inc. of Miami was ap- A PETTER diesel rated at 7 hp. supplies power for the Onan generator and Grasso's eighth Murphy powered trawlfor D. W. Onan & Sons, manufacturers the Marine Products auxiliary bilge er for the Gulf trade. pump on the newly launched Queenie B

launched trawler was powered with a 190 hp. Murphy diesel, 3:1 Snow Nabstedt reverse-reduction gears. This is Joe

FLORIDA-GEORGIA of Miami delivered to Andy's Truck Ser. a U.D. 18 International Harvester diesel to be used in a newly installed rock crushing plant. Also a Northwest crane powered with a 165 hp. Murphy diesel.

CLEVELAND Diesel Div., GM Corp. delivered a model 8-268-A rated 450 hp. at 1200 rpm. to the Southern Bell Telephone Co. for emergency. It is complete with a 300 kw. General Electric generator, Marquette governor, Leece-Neville starting motor and Briggs oil filters.

RECENT Cummins diesel installations included a model N.H.B. 600 rated at 200 in a truck for Beesley Trucking Co. of Jacksonville plus the new P.T. fuel system on a similar model in a Mack tractor for Chanticlier of Miami.

GENERAL Engine & Equipment of Tampa supplied the model 6-110 General Motors diesel with GM hydraulic clutch for the Casey and Brown, a trawler built by Tampa Marine Co.

DIESEL BRIEFS: The Nassau freighter Betty K with a 350 hp. Superior diesel and a 1 cyl. Witte diesel: Pat Malone is the Chief Engineer; and the Betty Frances, also of Nassau with a 150 Cummins.

Caterpillar Promotions

Caterpillar Tractor Co. announces the following promotions in its Peoria, Illinois plant manufacturing department: Gordon Swardenski, assistant manufacturing manager for the past 15 months, named manager of manufacturing. Cary L. Ice, engine factory manager in Peoria for four years, and also manager of the steel fabrication factory for the past year, becomes assistant manager of manufacturing. Robert E. Gilmore, assistant manager, engine factory since 1951, is now engine factory manager.

The promotions were subsequent to the recent naming of Charles A. Woodley as vice president of the Company and naming of Lloyd J. Ely to succeed him as manager of the Peoria plant. Appointment of Paul B. Benner as chief engineer at the Company's Decatur, Illinois plant, now under construction, is also announced. Benner has been an assistant chief engineer at Peoria since 1953.



progress brings change

Progress in the rapidly-growing diesel industry leads DIESEL PROGRESS to three MAJOR CHANGES in its 20th annual catalog.

1. NAME-Henceforth it is DIESEL CONSOLI-DATED CATALOG, no longer Diesel Engine Catalog as this selling tool has been called during its 19-year campaign to widen the use of engines and dieselized equipment.

2. FORMAT-Standard catalog page size hereafter. (7x10 in. type page; 8½x11 in. trim size.) This change in the format should reduce your production costs, give you multiple use from your catalog pages.

3. CONTENT-Only catalog pages and time-saving listings will appear in this easy-to-handle

volume. No display ads; no general editorial matter. This will be strictly a catalog-the one and only catalog for the leading manufacturers of diesel, gas, and dual-fuel engines, components, and engine accessories.

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A 4-page folder giving complete information and page rates was mailed recently with pattern pages. Check your files for it or wire for additional copies. Page format sheets will be sent free upon request.

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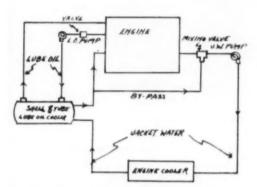
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Unusual Cooling Installation



Photo shows (right) the Trane GC6½-4 which cools the Nordberg engine's jacket coolant which in turn cools the lube oil. The Trane model EC-5½-4 cools the hydraulic oil used inside the fluid drive connecting the engine to the main pump.



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NE of the unique features of the Vicksburg Station of the Wolverine Pipe Line System (described in the November 1954 issue of DIESEL. PROGRESS) is the design of the plant which permits remote starting up of the engine from Hammond, Indiana, although it is at present manned by personnel at Vicksburg.

Such remote operation requires a fluid cooler that is unusually rugged and dependable. The installa-

tion is a tribute to the design and construction of the equipment used. The Trane company has two of their fluid coolers installed at the Vicksburg plant. The smaller of these fluid coolers is an EC-51/2-4 which is used to cool the hydraulic oil used inside the fluid drive connecting the 2,650 Nordberg diesel to the main pump. The hydraulic oil is circulated in a closed circuit.

The larger Trane fluid cooler is a GC-61/2-4 used to cool the jacket coolant of the large diesel. This jacket coolant is sub-cooled and is then used to cool the lube oil in the shell-and-tube exchanger. During the latter function, the sub-cooled water is brought up to the desired temperature for return to the diesel's cooling jacket.

The installation at Vicksburg utilizes ethylene glycol rather than water as the coolant. This permits unattended year round operation, in summer heat and winter cold. Inasmuch as it is a closed system. there is no leakage or spray loss and no foreign matter can get into the circuit.

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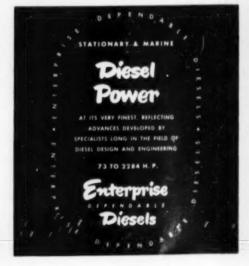
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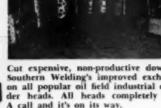


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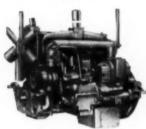
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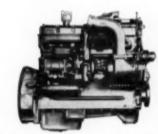
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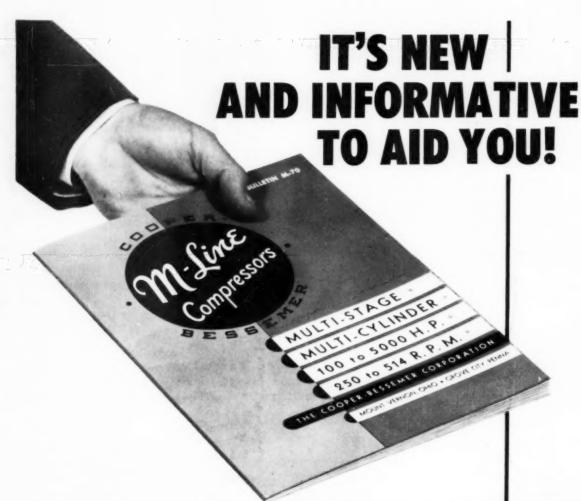
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